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Level II Screening Ecological Risk Assessment
Portland Shipyard, Operable Unit 2
Swan Island Upland Facility

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LIST OF ACRONYMS AND ABBREVIATIONS

1x-	One time
5x-	Five times
%	Percent
90UCL	90th percentile Upper Confidence Limit
ACA	Ash Creek Associates
bgs	Below Ground Surface
COIs	Contaminants of Interest
COPC	Chemicals of Potential Concern
CPECs	Contaminants of Potential Ecological Concern
CSM	Conceptual Site Model
DEQ	Department of Environmental Quality
EBV	Ecological Benchmark Value
Eco-SSL	Ecological Soil Screening Level
ECSI	Environmental Cleanup Site Information
EPCs	Exposure Point Concentrations
ERA	Ecological Risk Assessment
HHRA	Human Health Risk Assessment
LOAEL	Lowest Observed Adverse Effects Level
LWG	Lower Willamette Group
MDCs	Maximum Detected Concentrations
mg/kg	Milligram per kilogram
NOAEL	No-observed-adverse-effects level
OAR	Oregon Administrative Rule
OHWL	Ordinary High Water Line
ONHP	Oregon Natural Heritage Program
ORNL	Oak Ridge National Laboratories
OU	Operable Unit
PAHs	Polycyclic Aromatic Hydrocarbons
PCBs	Polychlorinated Biphenyls
Q	Receptor Designator
RI/FS	Remedial Investigation/Feasibility Study
SCE	Source Control Evaluation
SIUF	Swan Island Upland Facility
SLVs	Screening Level Values
T	Toxicity Ratio
TBT	Tri-n-butylin
T/E	Threatened and Endangered
TMDP	Technical-Management Decision Point
TQ	Toxicity Quotient
USEPA	Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
VCP	Voluntary Cleanup Program
VOCs	Volatile Organic Compounds

1.0 INTRODUCTION

This document presents the Level II Screening Ecological Risk Assessment (ERA) for the Swan Island Upland Facility (SIUF) Operable Unit 2 (OU2), Portland, Oregon. The ERA is being performed under a voluntary agreement (Voluntary Agreement) for remedial investigation, source control measures, and feasibility study for OU2 between the Port of Portland (Port) and Oregon Department of Environmental Quality (DEQ), dated July 24, 2006.

1.1 Purpose and Scope

A draft Level I Scoping ERA was prepared and submitted in February 2006 (NewFields 2006). Based on the results of the Level I analysis, it was determined that a Level II Screening ERA was warranted for potential exposure of ecological receptors to riverbank soils. This risk assessment report presents the scope of work, procedures used to complete, and results of a Level II Screening ERA for OU2 that meets the objectives of the Voluntary Agreement. This Level II ERA was based upon the process prescribed by DEQ in the *Guidance for Ecological Risk Assessment: Levels I, II, III, IV* (DEQ 1998 with updates through 2001).

The guidance describes a sequence for conducting ERAs, beginning with Level I Scoping. The purpose of the Level I ERA is to provide a conservative qualitative determination of whether there is reason to believe that ecological receptors and/or exposure pathways are present at OU2. If existing information indicates that site conditions will not result in exposure of ecological receptors, then no further risk analysis is necessary. If hazardous substances and exposure pathways are present, the process proceeds to a Level II Screening analysis to determine if hazardous substances are present at potentially ecotoxic concentrations and, if so, what additional risk analysis may be necessary to make risk management decisions for a facility.

In accordance with the Voluntary Agreement, the scope of the Level II ERA at OU2 is limited to the upland areas above the ordinary high water line (OHWL) of the Willamette River. The scope of the ERA does not include adjacent sediments, submerged lands, and submersible lands of the river, nor other adjacent upland sites. A Source Control Evaluation (SCE) to assess potential pathways, including transport of potentially erodable soils to the river will be developed and submitted under separate cover.

1.2 Facility Location, Description and History

The Facility consists of OU2 at the SIUF. The SIUF was previously referred to by DEQ as the "Swan Island Portland Ship Yard" and identified by DEQ as Environmental Cleanup Site Information (ECSI) Site 271. Figure 1-1 shows the location of the SIUF and the boundary of

OU2. OU2 consists of approximately 24 acres of upland property at the SIUF and is owned by the Port. It generally corresponds to the upland property formerly known as the "North Channel Avenue Fabrication Site". Prior to 2008, OU2 also included the paved parking area now designated as Operable Unit 4 (OU4). Specific details of site history are discussed in the Draft Supplemental Preliminary Assessment (Ash Creek Associates [ACA] 2006) and Remedial Investigation/Feasibility Study (RI/FS) work plan (Bridgewater 2000).

The Port developed Swan Island beginning in 1923, when the main navigation channel of the Willamette River was relocated to the western side of the island. River sediments dredged as part of the project were deposited on Swan Island to raise the surface elevation and construct a causeway connecting the island to the eastern shore of the river. This filling readied the island for development into the first Portland airport. Airport construction was completed and operations started in 1931. The airport operated until 1941, when it was relocated to northeast Portland.

In 1942, the U.S. Maritime Commission entered into an agreement to lease approximately 250 acres of Swan Island from the Port. The Maritime Commission then contracted with Kaiser Company for the construction and operation of a shipbuilding facility on the northwestern end of the island. Kaiser operated the shipyard until 1945. From 1945 until 1949, the shipyard was sub-leased by the United States to various tenants. In 1949, the Port purchased the shipyard assets. The Port managed the shipyard as a multi-user facility until 1996, and Cascade General and its successors have managed and operated the shipyard since.

OU2 has been used for relatively low-impact industrial activities throughout its history. A paved runway was present on OU2 during the period of operation of the municipal airport on Swan Island (1931 until 1941). From the 1940s to 1978, OU2 was primarily open land with railroad spurs used for materials receiving and storage. In 1978, the area was used to stage pre-cast concrete structures for construction of the ballast water treatment plant at Operable Unit 1 (OU1). From 1985 until 1990, OU2 was used by the Atlantic Richfield Company to construct modular units for oil processing on Alaska's North Slope. After 1990, OU2 was used for materials and equipment storage in support of ship repair activities; sand, gravel, and rock storage; for a concrete batch plant; and for truck and trailer parking.

1.3 Current and Future Site Uses

Currently, portions of OU2 are leased for truck trailer storage (Daimler) and a concrete batch plant (Cemex). The remainder of OU2 is vacant. The Daimler lease covers 7 acres at the southeastern end of OU2. The Cemex lease includes 12.1 acres in the central portion of OU2. Vacant areas include 2.7 acres along Berth 315, and the strip of land (2.4 acres) between the Daimler/Cemex leases and the ordinary high water line (OHWL).

The current and reasonably likely future land use for OU2 and the SIUF is industrial. The SIUF is currently zoned industrial and lies within the City of Portland Industrial Sanctuary and Swan Island Plan District. The SIUF is expected to continue to be used for industrial purposes, consistent with goals and policies stated in the City's Comprehensive Plan.

OU2 is surrounded by similarly developed tracts and no significant upland ecological resources are present within 1 mile of OU2. No change in conformation is anticipated for the foreseeable future.

1.4 Summary of Investigations

A Baseline Human Health Risk Assessment (HHRA) (ACA 2009a) was completed in September 2009. The HHRA provided a comprehensive summary of the multiple investigations conducted between 2000 and 2008 to support the RI and risk assessment efforts, as well as sampling performed on OU2 prior to the RI in 1998.

The following RI data collection activities and related reports at the OU2 Facility include the following:

- Remedial Investigation/Feasibility Study Work Plan for the Portland Shipyard (Bridgewater 2000);
- Phase IB Work Plan Addendum, Portland Shipyard Remedial Investigation (Bridgewater 2001);
- Phase IB and II Soil and Groundwater Sampling Results, Portland Shipyard Remedial Investigation (Bridgewater 2002);
- Operable Unit 2, Removal Action Report, Swan Island Upland Facility (Bridgewater 2006);
- Former Substation and Berth 305 Sampling Results Addendum, Swan Island Upland Facility (ACA 2007b);
- Swan Island Upland Facility, Operable Unit 2 Supplemental Sampling Results (Port 2007a);
- Memorandum: Storm Water Piping Removal Oversight (ACA 2007a);
- Memorandum: Outfalls, Swan Island Upland Facility – Operable Unit 2 (ACA 2008);
- OU2 Riverbank Soil Sampling and Pipe Abandonment, Swan Island Upland Facility (ACA 2009b);
- Swan Island Upland Facility, Operable Unit 2, Supplemental Groundwater Sampling Results (Port 2007b); and
- 2007 Annual Groundwater Monitoring Results, Swan Island Upland Facility, Remedial Investigation (Bridgewater 2008).

The data collected before 2006 were incorporated into the Level I ERA and the additional data collected since 2006 are considered in this Level II ERA.

1.5 Summary of Level I Scoping ERA

A draft Level I Scoping ERA was prepared and submitted in February 2006 (NewFields 2006) and is included in Appendix A. In addition, a comment letter was received from DEQ in March 2006 (DEQ 2006) and a subsequent letter was provided by the Port to DEQ in July 2006 (Port 2006). The letters (and attachments) are also included in Appendix A.

The Level I evaluation concluded that there are limited ecological resources present in the upland areas at OU2. The upland area is either devoid of vegetation in work/paved areas or contains sparse ruderal vegetation. Wildlife are unlikely to feed at OU2 and ecological exposures to surface soils at OU2 would be limited to occasional contact by birds or mammals that may cross OU2. Therefore, use by wildlife is likely to be intermittent and transient. There does not appear to be completed exposure pathways for terrestrial plant and animal populations in the upland portion of OU2.

The vegetated riverbank areas may be habitat for small birds and mammals, and may be visited by species such as beaver. However, no Facility-related operations ever occurred over water or along the rivershore, and the upland portions of OU2 do not drain to the riverbank. Except for the three locations where ARCO installed pipes to drain upland areas, upland areas have not drained to the riverbank. These pipes were capped when ARCO ceased its operations in 1990, and the Port removed the pipes in 2006 (ACA 2007a). Therefore, exposure of ecological receptors to site-specific contaminants on the riverbank or shoreline areas is unlikely. However, because complete exposure pathways are possible in the riverbank areas, it was determined by DEQ that a Level II screening analysis would be necessary.

Overall, based on the Level I ERA, it was determined that potential exposure pathways exist for ecological receptors that could contact contaminants of interest (COIs) in surface soils in riverbank areas as a result of potential transport from pipelines discharging on the riverbank. Potential ecological receptors are plants and invertebrates in the riverbank area and small birds and mammals that may visit that area.

1.6 Document Organization

Section 2 includes the description of ecological site conditions. Section 3 presents the methodology and results of the Level II Screening analysis, including identification of contaminants of potential ecological concern (CPECs) and a preliminary conceptual site model (CSM). Section 4 outlines the methodology and results of an expanded Level II analysis.

Technical Management Decision Points (TMDPs) and overall conclusions are summarized in Section 5. References are provided in Section 6.

2.0 ECOLOGICAL SITE DESCRIPTION

A facility visit was conducted by the project lead ecological risk assessor on October 31, 2005. The Level I Scoping ERA (NewFields 2006) presented an ecological site description based on an OU2 visit, aerial photographs, and general Facility knowledge. Site conditions have not changed appreciably since that time, and the ecological site description is presented below. Refer to the Level I Scoping evaluation in Appendix A for photographs from site visits.

2.1 Site Description and Site-Specific Ecological Receptors

The portions of OU2 that are northeast (i.e., inland) of the Willamette River bank are largely devoid of vegetation being composed of asphalt-covered parking lot or gravel-covered work areas with concrete slabs. Vegetation on most of the property is strictly ruderal, with sparse vegetation consisting of opportunistic or weedy annual species, but more commonly containing no vegetation at all (Figure 1-1). The surface soil conditions and use in these areas prevent more long-lived plant species from establishing and creating an early successional native habitat type. The unpaved portions of OU2 do not and will not provide suitable habitat for ecological receptors because of former, current, and reasonably likely future uses of the property (i.e., truck and trailer parking and aggregate processing).

The riverbank at OU2 is composed of fill material with rock, concrete debris and rip-rap. The riverbank area is densely vegetated with ground cover of grasses and shrubs, including introduced species such as Himalayan blackberry.

A variety of willow species (e.g., Pacific, Columbia River, and Piper's Willow) and black cottonwood saplings have become established on the beach. The vegetated area on the river bank (approximately 3-5 acres) is narrow (approximately 45-80 feet wide in 2005) and is disconnected from riparian upland areas. The riverbank does not have observable areas of erosion or bank sloughing. Please note the riverbank sampling locations in the Level II assessment include samples collected between OHWL and the evaluation corresponding to the ordinary low water line (OLWL). This is based on direction from DEQ to (1) sample these locations and (2) to use these data in the Level II characterization (DEQ 2006a & April 20, 2006 meeting as cited in DEQ 2006b).

During the site visit, no receptors other than waterfowl and other birds associated with the river were observed at OU2. However, it is possible that songbirds may utilize the shrub areas during other parts of the year.

The Willamette River near OU2 provides habitat for aquatic and semi-aquatic species. The river is identified as a sensitive environment in Oregon Administrative Rule (OAR) 340-122-0115. There are no wetlands or permanent waterbodies on OU2.

The Lower Willamette Group (LWG) collected crayfish, largescale sucker, sculpin, peamouth, and small mouth bass within one mile of OU2, but no biota sampling was attempted near the shore of OU2. The LWG collected sediment samples offshore of OU2 and a beach sediment sample from the beaches adjacent to OU2. The resulting data is being used in the Portland Harbor RI/FS.

2.1.1 Threatened and Endangered Species

A listing of threatened and endangered (T/E) species potentially present within a two-mile radius of OU2 was provided by the Oregon Natural Heritage Program (ONHP). The list includes historical presence of federal and state-listed T/E species. The Level I ERA in Appendix A summarizes the species listed by the ONHP. A copy of the letter from the ONHP identifying the species is also included in Appendix A.

Yellow-billed cuckoo is identified as a candidate T/E species in the vicinity. In the ONHP records, the last known observation of the yellow-billed cuckoo is along the Columbia River in 1985. According to the U.S. Fish and Wildlife Service (USFWS) species profile (USFWS 2010), Oregon counties in which the cuckoo is currently know to occur include: Harney, Deschutes, and Malheur. It is not listed as currently occurring in Multnomah County. Thus, no federally-listed T/E upland wildlife species are assumed to occur at OU2.

2.2 Observed Impacts

Ecological resources (habitat or food sources) are extremely limited within OU2, restricted to the narrow riverbank area. No ecotoxicological impacts on ecological receptors were observed at OU2.

2.3 Other Ecologically Important Species/Habitats

Based on the Facility visit, historical information, ONHP data, and general Facility knowledge, there are no rare or ecologically unusual habitats or species at the Facility.

3.0 LEVEL II SCREENING ANALYSIS

3.1 Methods for Level II Screening

The ecotoxicological risk screen was conducted according to DEQ guidance for Level II Screening ERA (DEQ 2001). DEQ guidance specifies several tasks when the Level II analysis is conducted independently. However, many of the tasks and much of the background information cited in the Level II guidance were addressed in the Level I evaluation (i.e., conduct site survey, provide site description, identify ecological receptors, and identify complete exposure pathways) and summarized in the previous section. Therefore, the analysis presented below focuses on the tasks that relate directly to conducting the Level II screen, including:

- evaluate data sufficiency (Task 1 of the guidance);
- identify candidate assessment endpoints (Task 6);
- identify known ecological effects (Task 7);
- calculate COI concentrations (Task 8); and
- identify contaminants of potential ecological concern (CPECs) (Task 9).

3.1.1 Data Available for Screening

There has been considerable sampling to support the RI; refer to Section 1.5 (Summary of Investigations). As summarized in the HHRA for the Facility (ACA 2009a), the RI for the Facility included chemical analysis of up to 97 soil samples and 14 groundwater samples. These data are of sufficient quality for use in a risk assessment (ACA 2009a).

This Level II ERA focuses specifically on soil data collected from riverbank area. Riverbank sampling locations are shown on Figure 1-1 and include: WR-164/RB-1 composite; WR-159/RB-2 composite; WR-160/RB-3 composite; WR-399/RB-4 composite; CG-26/RB-5 composite; CG-27/RB-6 composite; WR-159a/RB-7 composite; and PS-S-01-01/Boring 1. Soil samples from these locations were collected during sampling events previous to 2006, in September 2006, and in October 2008. Analytical results for all upland locations were presented in the HHRA. Refer to Appendix B of this document for analytical results for riverbank area surface soils. Appendix C of this document provides a summary of soil sample results, including the depth range of collected samples, detection frequency, minimum and maximum non-detected and detected concentrations.

As identified in the HHRA, the COIs include petroleum hydrocarbons, polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), phthalates, tri-n-butyltin (TBT) and

metals. Although volatile organic compounds (VOCs) were evaluated as COIs in the HHRA based on presence in groundwater, only two VOCs were identified as chemicals of potential concern (COPCs) in water (vinyl chloride and chloroform), and neither of those were detected in soil. Based on the lack of VOC detections in soil, and a lack of a complete exposure pathway for ecological receptors to encounter VOCs in surface soils of the riverbank, VOCs will not be considered as COIs in this Level II Screening ERA.

Samples were analyzed for a range of COIs including petroleum hydrocarbons, PAHs, PCBs (Aroclors), phthalates, TBT, and metals. The following list identifies which COIs were analyzed at each location:

- **RB-1 composite:** petroleum hydrocarbons, PAHs (and dibenzofuran for discrete sub-samples), PCBs, and metals;
- **RB-2 composite:** petroleum hydrocarbons, PAHs (and dibenzofuran for discrete sub-samples), PCBs, and metals;
- **RB-3 composite:** petroleum hydrocarbons, PAHs (and dibenzofuran for discrete sub-samples), PCBs, and metals;
- **RB-4 composite:** petroleum hydrocarbons, PAHs, PCBs, phthalates, TBT (and for discrete sub-samples), and metals (and lead for discrete sub-samples too);
- **RB-5 composite:** petroleum hydrocarbons, PAHs, PCBs, phthalates, TBT (and for discrete sub-samples), and metals (and lead for discrete sub-samples too);
- **RB-6 composite:** petroleum hydrocarbons, PAHs, PCBs, phthalates, TBT (and for discrete sub-samples), and metals (and lead for discrete sub-samples too);
- **RB-7 composite:** petroleum hydrocarbons, PAHs, PCBs, and metals (and lead for discrete sub-samples); and
- **Boring 1:** petroleum hydrocarbons, PCBs, and metals.

3.1.2 Candidate Assessment Endpoints

According to DEQ guidance (2001), assessment endpoints are "…an explicit expression of a value deemed important to protect, operationally defined by an entity (hereafter, "endpoint receptor") and one or more of that entity's measurable attributes…" Assessment endpoints serve to focus the ERA on species and measures that are directly relevant to risk management decisions for OU2. The assessment endpoints generally represent species or functional groups that are important to ecological function at a site, or rare species that have great ecological, aesthetic, or cultural value.

Assessment endpoints for a screening level assessment (e.g., Level II screening) are typically not as specific as those identified for baseline risk assessments where specific measures or data analysis methods are needed to make decisions. In addition, there are no T/E or other rare species known to use the Facility. For the DEQ Level II analysis, SLVs for soils have been

identified for general groups of organisms including plants, invertebrates, birds, and mammals. Therefore, the following candidate assessment endpoints were identified:

- Survival, growth, and reproduction of terrestrial plants;
- Survival, growth, and reproduction of terrestrial invertebrates;
- Survival, growth, and reproduction of terrestrial-feeding birds; and
- Survival, growth, and reproduction of terrestrial-feeding mammals.

3.1.3 Calculating COI Concentrations

Because wildlife receptors do not experience their environment on a "point" basis, environmental data for each COI need to be converted to an estimate of concentration over a habitat exposure area (DEQ 2001). Exposure-point concentrations (EPCs) are concentrations of COIs that represent a reasonable maximum exposure based on the media characteristics and site-specific receptors. The Level II guidance specifies that screening level EPCs can be based on (1) site maximum detected concentrations (MDCs) for immobile or nearly immobile receptors (i.e., plants and soil invertebrates), or (2) 90%-upper confidence limits (90UCL) of the mean concentrations for more mobile wildlife receptors (i.e., birds, mammals) (DEQ 2001).

EPCs of COIs for soil were calculated using data from riverbank locations to estimate reasonable maximum exposure for wildlife potentially visiting riverbank areas from adjacent locations. This approach assumes that wildlife receptors could utilize all areas of the riverbank; overall, riverbank habitat quality is considered low throughout. Soil samples with an upper depth less than 3 feet below ground surface (bgs) were included in the calculations, to adequately account for both surface soil exposure and exposure to potential burrowing animals.

All of the riverbank samples were collected as composite samples comprised of three to five sub-samples, with one exception (PS-S-01-01/Boring 1) that was collected as a grab sample. For some of the composite samples (WR-399/RB-4 composite; CG-26/RB-5 composite; CG-27/RB-6 composite; WR-159a/RB-7 composite), the discrete sub-samples were also submitted for analysis. The other composite riverbank samples (WR-164/RB-1 composite; WR-159/RB-2 composite; WR-160/RB-3 composite) were only submitted as composite samples. For use in determining an EPC based on MDC, all available sample results from composites, discrete sub-samples, and grab samples, were included in the determination. For determining an EPC based on 90UCL, only sample results from composite samples were used. This procedure prevented multiple results from the same sample from being included in the 90UCL calculation.

The U.S. Environmental Protection Agency (USEPA) ProUCL computer program (USEPA 2007a, 2009) was used to obtain data distribution evaluations and to calculate the 90UCLs for COIs that exceeded Level II bird and mammal screening criteria based on MDC. In accordance with ProUCL guidance, each data set was first tested to determine the data distribution and the

appropriate 90UCL estimation method was chosen based on the best distribution fit and recommendations provided by ProUCL. DEQ guidance (DEQ 2001) suggests that non-detects should be included with values of one-half their detection limits. However, the latest ProUCL package includes computation methods (e.g., Kaplan-Meier) that can be used for datasets with non-detect values and so this methodology was used in 90UCL calculations.

3.1.4 Frequency of Detection and Background Analysis

COIs were screened on the basis of detection frequency and comparison to regional background levels before being compared to toxicity SLVs, as outlined in Task 9 of the Level II guidance (DEQ 2001). COIs detected in less than 5% of the samples were excluded as CPECs on the basis of infrequent detection (DEQ 2001). The MDCs for metals in soils were compared to regional background concentrations, as presented in the DEQ Toxicology Workgroup Memorandum (DEQ 2002). If the MDC for a COI was less than the background value, then the COI was excluded as a CPEC (DEQ 2001).

3.1.5 Screening Level Values (SLVs)

SLVs published by DEQ (2001) for use in Level II analyses were used in the screening level analysis. These values are based on no-observed-adverse-effects levels (NOAELs) for each of the COIs. Therefore, if site concentrations are less than the SLV, no adverse effects are expected and no further analysis is required because risk is assumed to be negligible. It should be noted that the SLVs are based on intensive use of a site by receptors. Because OU2 is industrialized, and will remain so, ecological receptors are unlikely to utilize the site at levels represented in the SLVs. Therefore, concentrations that exceed the SLV do not necessarily represent unacceptable risk, but indicate that additional evaluation of site conditions may be necessary to support risk management decisions.

3.2 Level II Screening Results and Identification of Contaminants of Potential Ecological Concern (CPECs)

CPEC identification followed Task 9 of the DEQ guidance (DEQ 2001), including consideration of detection frequency, background comparison, cumulative risk from multiple COIs, bioaccumulative toxins, and screening level availability. CPECs were identified by calculating the toxicity ratio (T) of the EPC (MDC or 90UCL) of each of the COIs to Level II SLVs (DEQ 2001). The guidance indicates two potential levels of analysis for soil COIs. For threatened or endangered species, the toxicity ratio is compared to the “receptor designator” (Q) value of 1 (i.e., if the riverbank soil concentration exceeds the SLV, the constituent is identified as a CPEC). For non-protected species, T is compared to a Q value of 5 (i.e., if the riverbank soil concentration exceeds five times [5x-] the SLV, the constituent is identified as a CPEC). For completeness, both levels of results are presented. However, CPECs for OU2 are identified

based on Q=5 because no T/E species are present or expected at the site. In addition, potential risk to a receptor from multiple COIs simultaneously within a given medium was addressed by comparing T of an individual COI to the sum of T for all COIs.

Appendix C presents results of soil screening based on MDCs for plant, invertebrate, bird, and mammal receptors. For each COI, the tables show a detailed data summary, the MDC, SLVs, and results of the data comparison. Appendix D presents results of soil screening based on 90UCLs for bird and mammal receptors.

3.2.1 Frequency of Detection and Background Analysis

For riverbank soils at the Facility, MDCs of antimony, chromium, nickel, selenium, and silver were less than regional background concentrations and these analytes are excluded as CPECs (Appendix C), in accordance with Task 9 of DEQ guidance (DEQ 2001). It should be noted that the chromium background level exceeds the SLVs, indicating that this SLV is probably too conservative for use in the Portland area. Facility concentrations of chromium are below background level and so this COI is not considered a CPEC. MDCs of arsenic, cadmium, copper, lead, and zinc exceeded regional background concentrations (Appendix C). Mercury was not detected in soil samples at a detection limit of 0.1 milligrams/kilogram (mg/kg), which exceeds the background level of 0.07 mg/kg.

Fifteen COIs were excluded as CPECs because there was less than 5% detection frequency for those analytes (DEQ 2001). None of those analytes were detected in riverbank soils. These analytes either 1) don't have SLVs; or 2) have a maximum detection limit that doesn't exceed the SLV. No analytes for riverbank soils were excluded as CPECs based on frequency detection analysis where detects or detection levels exceeded SLVs.

3.2.2 Screening Analysis

Identification of Candidate CPECs

COIs for which the MDC exceeded at least one SLV with Q greater than 1 are considered "candidate CPECs" that are subject to further analysis, including calculation of 90UCLs, and comparison to appropriate risk ratios. In addition, candidate CPECs were also identified as a result of potential risk to a receptor from multiple COIs simultaneously within a given medium (DEQ 2001). For riverbank soils in OU2, 5 candidate CPECs (arsenic, chromium, copper, lead, zinc, and dibenzofuran) were identified.

The Facility does not have suitable habitat for T/E species and so a risk ratio of 5 corresponding to non-T/E species is the applicable benchmark for identifying CPECs (i.e., the MDC or 90UCL are greater than 5x-SLV) (DEQ 2001). Table 3-1 summarizes results of the soil toxicity screens

for COIs for which the MDC or 90UCL exceeded at least one SLV with a risk ratio greater than 5.

Comparison of MDCs to SLVs for Non-Wildlife Receptors

Refer to Appendix C and Table 3-1 for the results of screens for plants and soil invertebrates (i.e., non-wildlife receptors) based on comparisons of the MDCs to SLVs. Zinc was identified as a CPEC for plants and copper was identified as a CPEC for invertebrates (Table 3-1).

Comparison of 90UCLs to SLVs for Wildlife Receptors

For bird and mammal receptors (i.e., wildlife receptors), EPCs based on 90UCLs were calculated for candidate CPECs. Refer to Appendix D and Table 3-1 for the results of screens based on comparisons of the calculated 90UCLs to SLVs. Zinc was identified as a CPEC for birds; no CPECs were identified for mammal receptors (Table 3-1).

Additional evaluation of the potential risks associated with zinc and copper are further discussed in Section 4.0.

4.0 EXPANDED LEVEL II ASSESSMENT

The SLVs are intended as conservative estimates of soil concentrations below which no adverse impacts are expected to ecological receptors under any exposure conditions. However, they are not meant as cleanup values and exceedence of the SLVs does not necessarily indicate unacceptable ecotoxicological risk or should be used as cleanup criteria (DEQ 2001). USEPA's Ecological Soil Screening Levels (Eco-SSLs) were developed in a similar context (USEPA 2005).

An objective of the Level II Screening is to assist in determining whether additional ecological risk analysis is necessary to support risk management decisions for a site. Results of the Level II Screening identified some chemicals, primarily metals, that exceeded conservative screening values established by DEQ. Zinc (birds, plants) and copper (invertebrates) were identified as CPECs based on screening analyses. Although risk ratios (i.e., ratios between the MDCs and the SLVs) exceeded the screening criteria, the Level II risk ratios were relatively low, indicating that exposure levels that were near screening levels indicative of acceptable risk based on DEQ guidance. Based on discussions with DEQ, additional risk analysis was included in the Level II ERA to provide additional context for the decisions to be addressed in TMDP 3 and TMDP 4. Specifically, determine whether a Level III ERA is necessary to support a risk management decision for OU2.

4.1 Expanded Level II Assessment – Plants/Invertebrates

Figure 4-1 shows detected zinc soil concentrations at each of the riverbank locations compared to SLVs and 5x-SLVs for plants. Zinc concentration exceeded the 5x-SLV for plants at 3 of the 8 sampling areas along the riverbank. These results suggest that plants at these locations could experience toxic exposures to zinc, especially at the highest concentration (835 mg/kg). However, the background soil zinc concentration (86 mg/Kg) exceeds the SLV, suggesting that this screening value may be overly conservative for determining potential phytotoxicity from zinc in this region. In addition, sitewide zinc concentrations and qualitative observations during site visits do not indicate phytotoxicity along the riverbank. Therefore, while zinc may be present at concentrations above SLVs, it seems unlikely that zinc is impacting plant communities at OU2. Physical and biological stressors, including poor quality of the riverbank soils (comprised of fill material with rock, concrete debris and rip-rap) and invasive vegetation such as Himalayan blackberry, are more likely to significantly limit vegetation communities and habitat value.

Figure 4-2 shows detected copper soil concentrations at each of the riverbank locations compared to SLVs and 5x-SLVs for invertebrates. Copper concentration exceeded the 5x-SLV for invertebrates at 1 of the 8 sampling areas along the riverbank. Based on this limited

distribution, it seems unlikely that copper toxicity is likely to be limiting the invertebrate community at OU2.

4.2 Expanded Level II Assessment - Birds

The additional risk analysis for birds focuses on zinc and expands on the Level II screening by:

1. Identifying a representative bird receptor species with a omnivorous (plant and invertebrate) diet (American robin);

2. Replacing the simple comparison of site soil concentrations to SLVs with an estimation of daily intake of zinc by birds through ingestion of prey and soils; and.

3. Comparing the zinc intake with a range of ecological benchmark values (EBVs) instead of a single SLV.

These steps are more consistent with the exposure assessment and risk characterization components of a baseline risk assessment and are intended to provide risk managers with additional information to support risk management decisions for zinc in OU2 soils.

4.2.1 Representative Bird Receptor

The American robin (*Turdus migratorius)* was identified as the representative receptor for terrestrial-feeding birds because of its small home range and omnivorous diet, and because it was the basis for the DEQ SLVs for exposure of birds to zinc in soils. Small birds, such as American robins, are sensitive to metals and represent the potentially most affected receptors. These organisms have relatively small home ranges, and could spend all or most of their time along a riverbank area, feeding on both vegetation and invertebrates that could contact affected soils. Also, resident birds could conceivably be exposed to soil contaminants during the reproduction stages of their life cycle. This is important because adverse effects on ability to reproduce are especially important to maintaining populations. Therefore, the American robin is a good representative for assessing potential risk to resident, terrestrial-feeding birds at the Facility.

4.2.2 Exposure Estimation Methodology

The expanded Level II risk analysis further evaluates the exposure estimate of zinc intake in the diet of the American robin, the representative bird receptor. The additional risk analysis was based on standard methods for estimating exposure from food ingestion and incidental ingestion of soils (USEPA 2005, 1993). Refer to Table 4-1 for a summary of parameters and exposure equations used in the estimation of intakes. Standard dietary intake equations were

used to estimate the amount of zinc that an avian receptor could obtain from ingestion of plant and/or animal tissue. The rates for intake of forage, prey, water, and incidental ingestion of soils were obtained from the Wildlife Exposure Factors Handbook (USEPA 1993). Since no site-specific data on biological tissue were available, CPEC concentrations in food were estimated using empirically derived uptake relationships from ecotoxicological literature (i.e., Bechtel-Jacobs 1998 and Sample et al. 1999 as recommended in USEPA 2005). In addition to the ingestion of CPECs accumulated in food items, robins may also be exposed to CPECs through the inadvertent ingestion of surface soil while foraging. Although wildlife receptors may also be exposed to CPECs through the ingestion of surface water, there is no surface water available on the Facility and this exposure pathway was considered incomplete for OU2.

The assimilation efficiency or bioavailability of zinc in ingested soils or biota was conservatively assumed to be 100%. This is a conservative estimate since the bioavailability of most metals is less, especially directly from incidentally ingested soils or soils in gut content of prey items. Calculation of total intake also assumes that all animals in the subpopulation being assessed obtain 100% of exposure from areas under evaluation (i.e., area use factor equal to 100%).

4.2.3 Ecological Benchmark Values (EBVs)

The expanded Level II risk analysis included a range of EBVs obtained from widely used and accepted toxicological literature sources, consistent with the assumptions outlined in the DEQ guidance (DEQ 2001). The EBVs span a range of concentrations and effects levels. They include NOAELs and lowest-observed-adverse-effect-levels (LOAELs) for a variety of endpoints (survival, growth, reproduction) that were developed based on information provided in Sample et al. (1996) and USEPA's Eco-SSL document for zinc (USEPA 2007b). Refer to Table 4.2 for the EBVs that were used in the expanded Level II risk estimation.

The use of these additional EBVs is consistent with the baseline risk assessment because they represent a range of effects and multiple studies. This is consistent with Oregon DEQ guidance because it includes endpoints other than a sublethal NOAEL and is consistent with USEPA guidance (1998) because it includes a range of effects and effect levels (i.e., NOAELs and LOAELs).

In particular, the NOAEL EBV used by USEPA to develop the EcoSSL for zinc may be a more robust estimate of avian zinc NOAELs than the one used by DEQ to develop the SLV because it was based on a wider range of studies and test species, and was subject to a nationwide peer review process conducted by EPA. The NOAEL EBV used by DEQ to develop the SLV is based on ORNL (1996), and is based on data from a single study on white Leghorn Chickens (Stahl et al 1990).

In DEQ's probabilistic Level III Baseline Risk Assessment process, the acceptable risk level is based on a lethality endpoint and corresponds to exposures in which 50% of test animals

survived (i.e., an LD50 or LC50). Therefore, EBVs based on survival (mortality) are included in the range of EBVs for the expanded analysis. However, note that the acceptable risk level for the Level III is also based on a probabilistic assessment that is not necessarily directly comparable to the toxicity quotient approach used below.

4.2.4 Results for Birds

Results of the exposure calculation and comparison to the EBVs are shown in Table 4-3. A toxicity quotient (TQ) was calculated as the ratio between the estimated exposure and the EBV (DEQ 2001):

Toxicity quotient (TQ) = exposure estimate/EBV

In most ecological risk assessment contexts, NOAEL- based TQs equal to or less than 1.0 indicates no adverse effects are expected (i.e., *de minimus* risk) and no further risk analysis is necessary to support site risk management decisions (see for example, EPA 1997). NOAEL HQs greater than 1 do not necessarily indicate unacceptable risk, but that additional risk analysis may be necessary to support risk management decisions. LOAEL TQs greater than 1 also may not necessarily equate to unacceptable risk, but indicate that sensitive individuals in a population may be affected. At exposures increasingly greater than the LOAEL, a greater number of individuals could be affected, and if exposures are high enough, or widespread enough, adverse impacts on populations could occur.

Table 4-3 shows TQs calculated for each EBV based on the exposure estimate for zinc. Important aspects of the TQ results are:

- The highest TQ (5.52) was slightly greater than 5, and was based on the lowest NOAEL EBV which was used by DEQ to develop the SLV; and
- The TQ associated with the EcoSSL NOAEL EBV (1.21) is essentially equal to 1.

The estimated exposures exceed the lowest NOAEL EBV, which was the basis for the DEQ SLV. However, it should be noted that the background soil zinc concentration corresponds to a TQ of 2.8 using this EBV, indicating that this NOAEL may be overly conservative for use in this type of risk analysis in the Portland area.

The TQ associated with the EcoSSL NOAEL is 1.21 indicating that the exposure is essentially equal to the EPA NOAEL value. As noted above, a NOAEL-TQ of 1 or less is often associated with *de minimus* risk. Overall, these results suggest a low risk of ecologically significant impacts from zinc on omnivorous birds that visit the OU2 habitat, and correspondingly low risk to local populations.

4.3 Preliminary Conceptual Site Model

According to DEQ guidance (2001), information on ecologically important receptors, assessment endpoints, CPECs, exposure routes, and potential effects can be integrated to create a preliminary conceptual site model (CSM). The CSM should consist of "risk hypotheses" that describe predicted relationships between CPECs, exposure, and assessment endpoint response (i.e., a statement of how each CPEC might affect ecologically important components of the natural environment).

For the Facility, complete exposure pathways exist for ecological receptors that could contact CPECs in surface soils in riverbank areas, or ingest plants or invertebrates which are accumulating CPECs. The COIs at OU2 are not bioaccumulative in terrestrial environments. Therefore, the exposure assessment is limited to direct contact (including incidental ingestion) with soils, and ingestion of plants and invertebrates at the riverbank areas. Potential ecological receptors are plants, invertebrates, and small birds and mammals that may visit the riverbank area. Based on Level II Screening, CPECs are copper (invertebrates) and zinc (plants and birds). Copper and zinc are both essential trace elements for plants and animals. In excess, zinc can cause iron chlorosis in plants, and decreased body weight, gizzard and pancreatic lesions, and biochemical changes in birds (USEPA 2007b). Copper can cause a variety of toxic effects, including altered permeability of cellular membranes, in terrestrial organisms (Eisler 1998). These impairments could potentially lead to a loss of individuals or populations.

The expanded Level II assessment 1) further evaluated potential effects of elevated CPEC concentrations on plant and invertebrate populations at OU2, and 2) evaluated whether the zinc in surface soils along the riverbank would yield zinc concentrations in prey that would exceed levels known to cause mortality or impair reproduction and growth in birds. For plants, invertebrates, and birds, concentrations of CPECs are not expected to significantly affect populations of these receptor types at OU2.

5.0 ECOLOGICAL RISK ASSESSMENT CONCLUSIONS

5.1 Technical-Management Decision Points (TMDPs)

According to DEQ guidance (2001), TMDPs are steps in the risk assessment process where one of three recommendations is determined: 1) no further ecological investigations at OU2; 2) continuation of the risk assessment process to the next level; or 3) undertake a removal or remedial action. DEQ guidance identifies two TMDPs at the end of the Level II screening process. The information gathered during the Level I Scoping and Level II Screening processes are used to evaluate TMDP 3 and TMDP 4.

5.1.1 TMDP 3

This TMDP is intended to help determine whether unacceptable ecological risk is probable. According to DEQ guidance (2001), the potential for risk exists when CPECs are present and there are complete exposure pathways between contaminated media and ecological receptors. The Level I scoping indicated that the potential for exposure exists at riverbank areas of OU2 based on the presence of habitat, albeit of marginal quality, and possible contact of ecological receptors to contaminants transported to those areas. However, the guidance indicates that unacceptable risk is probable only if the locality exhibits the following three criteria: 1) contains any individuals of a T/E species, critical habitat of a T/E species, or contains habitat of sufficient size and quality to support a local population of non-T/E species; 2) CPECs were selected on the basis of exceedance of SLVs or because they have a high potential to bioaccumulate; and 3) there appears to be plausible links between CPEC sources and endpoint receptors (DEQ 2001).

As described in the Level I ERA, and referenced above, there are no known T/E species and the habitat size and quality at OU2 is currently relatively low. By itself, it may not be sufficient to support a self-propagating population of vertebrate wildlife receptors such as birds or mammals. The CPECs identified in the Level II Screen were identified based on the exceedence of SLVs. However, the expanded Level II analysis suggests low risk of toxic exposure to individuals at OU2, and low risk to local populations if the site exposure remains at current levels.

In terms of links between CPEC sources and endpoint receptors, the upland portion of OU2 is currently industrial use and is expected to remain so for the foreseeable future. As a result, terrestrial wildlife receptors are unlikely to spend substantial amounts of time feeding or engaged in other behaviors that would result in substantial contact with soils at OU2. The riverbank areas of OU2 contain more extensive vegetation, but do not represent significant habitat for rare or important plant communities and include substantial portion of non-native

species. Relative use of OU2 by terrestrial receptors is minimal, only a small amount of marginal habitat exists at OU2. Decisions regarding the probability of unacceptable risk from environmental media should include consideration of these factors. Based on these results, the probability of unacceptable ecological risk from upland soils is minimal, and does not warrant additional remediation at OU2.

5.1.2 TMDP 4

This TMDP assesses whether a remedial action decision is possible based on the existing information and current levels of uncertainty. Specifically, if cleanup would be less costly than further investigation and data are adequate to select and approve a remedy action, then further ecological investigation should be deferred in favor of a response action. The alternative is for the assessment process to proceed to Level III for further evaluation. Based on information gathered during the Level I Scoping and Level II Screening processes, the existing information is adequate to conclude that remediation at OU2 is not necessary based on ecological risk.

5.2 Overall Level II ERA Conclusions

Based on the Level I Scoping and Level II Screening processes, potential ecological risk to terrestrial receptors from upland soils at OU2 is low. While contact with CPECs in soils is possible for some terrestrial receptors visiting riverbank areas of OU2, exposure is unlikely to reach levels of concern defined in DEQ guidance for non-T/E species. Only zinc (plants and birds) and copper (invertebrates) were identified as CPECs in the Level II analysis. The expanded Level II analysis indicated that risk to plants and birds from zinc and invertebrates from copper are expected to be low. Based on these results, the probability of unacceptable ecological risk from upland soils is minimal, and does not warrant additional risk assessment (i.e., Level III), nor more sampling to support a risk management decision.

6.0 REFERENCES

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TABLES

TABLE 3-1 Summary of CPECs - Riverbank Soils

Swan Island OU2 Upland Facility - Riverbank Soils - Oregon Screening Levels (Ecological Receptors)

Analyte (COIs)	Plants[1]	Invertebrates[1]	Birds[2]	Mammals[2]
	MDC	MDC	90UCL	90UCL
Arsenic	NO	NO	NO	NO
Copper	NO	**YES**	NO	NO
Lead	NO	NO	NO	NO
Zinc	**YES**	NO	**YES**	NO
Dibenzofuran	--	--	--	NO

Notes:
CPECs - contaminants of potential ecological concern
COIs - constituents of interest
SLV - screening level value
DEQ - Oregon Department of Environmental Quality
MDC - maximum detected concentration
90UCL - 90% upper confidence limit
HQ - hazard quotient
T/E - threatened/endangered

1 - For plants and invertebrates, CPECs are COIs whose MDCs exceed a DEQ Level II SLV at the Q=5 level for non-T/E species and background levels.

2 - For birds and mammals, CPECs are COIs whose 90UCLs exceed a DEQ Level II SLV at the Q=5 level for non-T/E species and background levels.

-- = indicates that there is no SLV for the receptor
Highlights indicate that MDC or 90UCL is greater than SLV for non-T/E species (Q=5)

TABLE 4-1 Approach for Calculation of Estimated CPEC Intake for Modeled Receptor - American Robin

Swan Island OU2 Upland Facility Riverbank Soils

Modeled Receptor: American Robin

Intake Equations:

Equation (a) - total CPEC intake

$$Intake_{total} = Intake_{food} + Intake_{water} + Intake_{soil}$$

Parameters - Equation (a):

Parameter	Description	Units	Value	Source/Notes
$Intake_{food}$	average daily intake from ingestion of prey items (vegetation and animal tissues).	mg/kg	calculated	See Equation (b)
$Intake_{soil}$	average daily intake from incidental ingestion of surface soil.	mg/kg	calculated	See Equation (c)
$Intake_{water}$	average daily intake from the ingestion of water.	mg/kg	0	No surface water at Upland Facility; water intake assumed to be 0.

Equation (b) - CPEC intake from food

$$Intake_{food} = AUF * \left(\sum_{i=1}^{N} B_{ij} * P_i * FIR \right)$$

Parameters - Equation (b):

Parameter	Description	Units	Value	Source/Notes
$Intake_{food}$	Intake for contaminant (j) in food	mg dw/kg bw-d	calculated	
AUF	Area use factor	unitless	1	Fraction of food derived from site; area use assumed to be 100%
FIR	Food intake rate	kg dw/kg bw-d	0.14	EPA 2005 - average of mean values for avian granivore and avian insectivore[1]
B_{ij}	Concentration of contaminant (j) in biota type (i) where $\ln(B_{ij}) = Intercept_{ij}+Slope_{ij}*\ln(Soil_j)$	mg/kg dw	Zinc: $\ln(B_{plants})=(0.554*\ln(Soil_j))+1.575$	Plant concentration equations from Bechtel-Jacobs 1998 and invertebrate concentration equations from Sample et al. 1999, as recommended in EPA 2005
			Zinc: $\ln(B_{inverts})=(0.328*\ln(Soil_j))+4.449$	
N	total number of ingested prey types	unitless	2	EPA 1993 - American robin diet
P_i	fraction of food as prey type$_i$	unitless	Plants - 0.29	EPA 1993 - American robin diet
			Invertebrates - 0.71	

Table 4-1 Approach for Calculation of Estimated CPEC Intake for Modeled Receptor - American Robin

(continued)

Equation (c) - CPEC intake from ingested soil

$$Intake_{soil} = AUF * (FIR * P_s * C_{js} * AF_{js})$$

Parameters - Equation (c):

Parameter	Description	Units	Value	Source/Notes
$Intake_{soil}$	Intake for contaminant (j) in soil	mg dw/kg bw-d	calculated	
C_{js}	Concentration of contaminant (j) in soil (s)	mg/kg dw	available data	All available site-wide sample data
FIR	Food intake rate	kg dw/kg bw-d	0.14	EPA 2005 - average of mean values for avian granivore and avian insectivore[1]
P_s	Proportion of total mass intake that is soil	kg soil/kg food	15.15%	EPA 2005 - average of 90th percentile values for avian granivore and avian insectivore
AF_{js}	Bioavailability factor of contaminant (j) in soil	unitless	1	Assumed to 100%
P_i	Fraction of food as prey type$_i$	unitless	Plants - 0.29 Invertebrates - 0.71	EPA 1993 - American robin diet
AUF	Area use factor	unitless	1	Fraction of food derived from site; area use assumed to be 100%

Notes:

1 - Mourning dove and American woodcock are surrogate species for avian granivore and avian insectivore, respectively.

mg - milligram
kg - kilogram
dw - dry weight
bw - body weight
d - day

Sources:

Bechtel-Jacobs. 1998. Empirical Models for the Uptake of Inorganic Chemicals from Soil by Plants. Bechtel-Jacobs Company LLC, Oak Ridge, TN. BJC/OR-133.

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TABLE 4-2 Ecological Benchmark Values (EBVs)

Swan Island OU2 Upland Facility Riverbank Soils

Modeled Receptor: American Robin

Analyte	Ecological Benchmark Value	Units	Type of Value	Source/Notes
Zinc	14.5	mg dw/kg bw-d	Rep/Gro NOAEL	Sample et al. 1996 - NOAEL based on avian toxicity data related to reproduction endpoints (food exposure duration for at least 10 weeks)
	66.1		Rep/Gro/Mor NOAEL	"A geometric mean of the NOAEL values for reproduction and growth ... is lower than the lowest bounded LOAEL for reproduction, growth, or survival." (Figure 5-1 in EPA 2007)
	126.3		Mor NOAEL	Arithmetic mean of NOAELs for mortality endpoints from studies of food consumption exposure over long duration (from Table 5-1 EPA 2007)
	131		Rep/Gro LOAEL	Sample et al. 1996 - LOAEL based on avian toxicity data related to reproduction endpoints (food exposure duration for at least 10 weeks)
	274.6		Mor LOAEL	Arithmetic mean of LOAELs for mortality endpoints from studies of food consumption exposure over long duration (from Table 5-1 EPA 2007)

Notes:
EBV = Ecological Benchmark Value
mg dw/kg bw-d = milligrams of dry weight per kilogram of body weight per day
LOAEL = Lowest Observed Adverse Effects Level
NOAEL = No Observed Adverse Effects Level
Rep/Gro = Reproductive/Growth
Mor = Mortality

Sources:

Sample, B.E., D.M. Opresko, D.M., G.W. Suter II. 1996. Toxicological Benchmarks for Wildlife: 1996 Revision. Risk Assessment Program, Health Sciences Research Division, Oak Ridge, TN. Publication ES/ER/TM-86-R3.

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TABLE 4-3 Exposure Calculation and Comparison to EBVs

Swan Island OU2 Upland Facility Riverbank Soils

Modeled Receptor: American robin, omnivorous bird

Toxicity quotient calculations

Constituents of Interest (COI)	EPC-90UCL (mg/kg)	Exposure Estimate (mg/kg BW/ day)	EBV (mg/kg BW/ day)	Type of EBV	Toxicity Quotient (TQ)
Zinc	480.1	80.03	14.5	Rep/Gro NOAEL	5.52
			66.1	Rep/Gro/Mor NOAEL	1.21
			126.3	Mor NOAEL	0.63
			131.0	Rep/Gro LOAEL	0.61
			274.6	Mor LOAEL	0.29

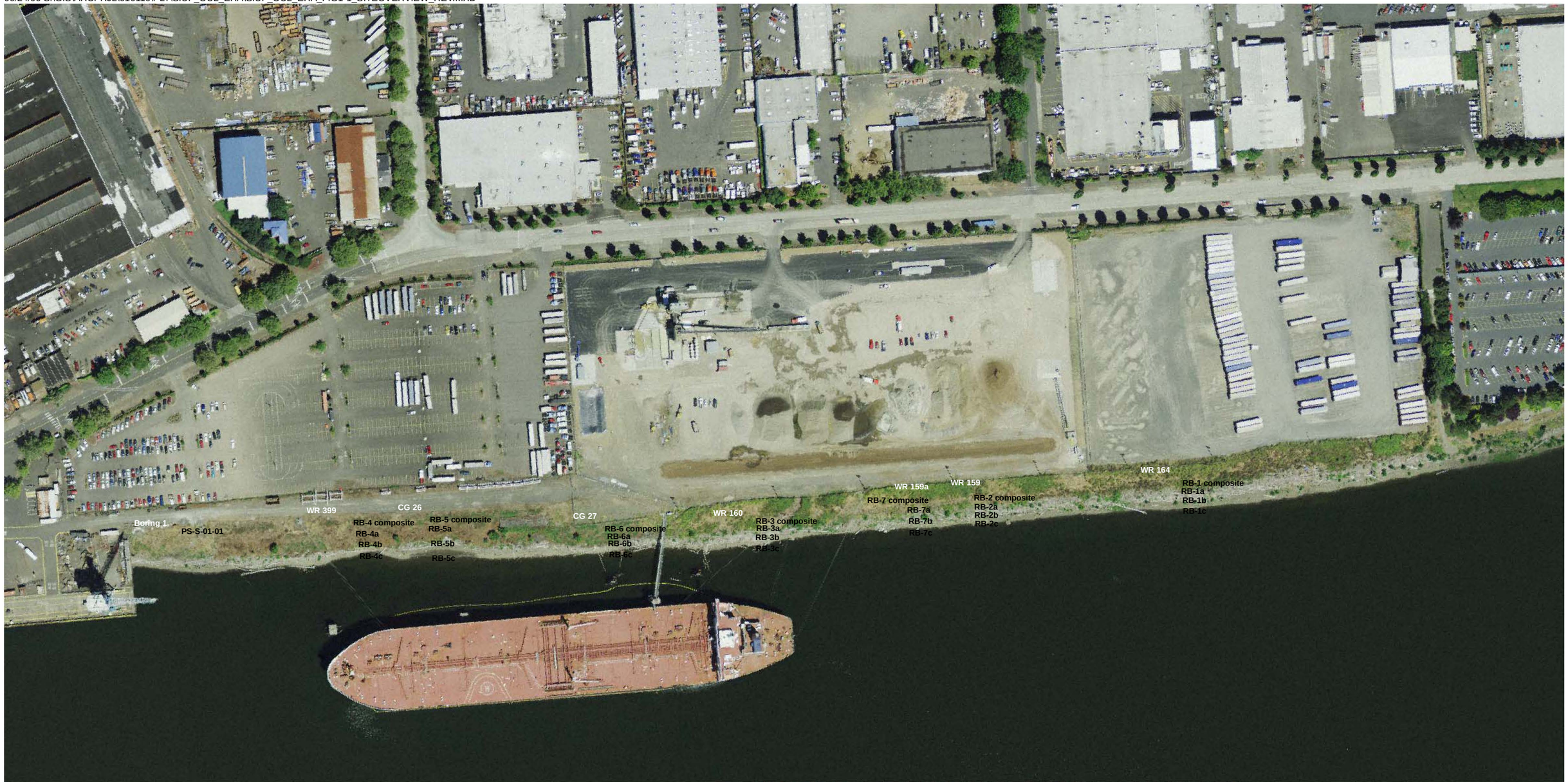
Parameters

Exposure Parameters	Value	Unit
IRsoil	0.15	kg soil/kg food
IRfood	0.14	kg dw/kg bw-d
Pplant	0.29	fraction
Pinverts	0.71	fraction
Soil bioavailability factor - zinc	1	unitless

Notes:
EPC = Exposure Point Concentration
EBV = Exposure Benchmark Value
TQ - Toxicity Quotient
90UCL = 90th upper confidence limit
Refer to Tables 4-1 and 4-2 for all exposure parameters, EBVs, and equations

FIGURES

06/24/09 S:\GIS\ARCPRJ2\010116\PLT\SIUF_OU2_ERA\SIUF_OU2_ERA_FIG1-1_SITEOVERVIEW_REV.MXD



Legend

Outfalls/Sampling Areas

Abandoned

Active

Riverbank Sampling Locations

Approximate OU2 Boundary

Approximate OU4 Boundary

Approximate OU1 Boundary

Notes:
- OU = Operable Unit
- Composite samples are comprised of combining discrete samples but are presented as separate points on figure, so as to be able to present results for those samples.
- Aerial photography - July 2007
- Boundaries and sampling locations are approximate; based on information provided by Ash Creek Associates.

0 100 200 Feet

SWAN ISLAND UPLAND FACILITY
PORT OF PORTLAND, OREGON

FIGURE 1-1

SWAN ISLAND UPLAND FACILITY
OPERABLE UNIT 2
SITE OVERVIEW

PRJ: 007-013
REV: 0

MAR 30, 2010
BY: RCR CHK: MCL

FORMATION ENVIRONMENTAL

S:\GIS\ARCPRJ2\010116\PLT\SIUF_OU2_ERA\SIUF_OU2_ERA_FIG4-1_ZINEXC_REV.MXD

Legend

Outfalls/Sampling Areas

Abandoned

Active

Zinc Exceedances

Result (mg/kg DW)

<50 (1x Plant SLV)

50.1 - 86 (Background)

86.1 - 250 (5x Plant SLV)

>250

Approximate OU2 Boundary

Approximate OU4 Boundary

Approximate OU1 Boundary

Riverbank Sampling Locations

Notes:
- OU = Operable Unit
- Composite samples are comprised of combining discrete samples but are presented as separate points on figure, so as to be able to present results for those samples.
- Aerial photography - July 2007
- Boundaries and sampling locations are approximate; based on information provided by Ash Creek Associates.
-Level II Screening Level Values (SLVs) from Oregon Department of Environmental Quality (DEQ), Table 1, Guidance for Ecological Risk Assessment, December 2001.
- Background (bkg) values from Oregon DEQ Toxicology Workgroup Memorandum to DEQ Cleanup Project Managers regarding "Default background concentrations for metals". October 28, 2002.

0 100 200 Feet

SWAN ISLAND UPLAND FACILITY
PORT OF PORTLAND, OREGON

FIGURE 4-1

SWAN ISLAND UPLAND FACILITY
OPERABLE UNIT 2
PLANT SCREENING LEVEL EXCEEDANCES
ZINC

PRJ: 007-013
REV: 0

DATE: MAR 30, 2010
BY: RCR CHK: MCL

FORMATION ENVIRONMENTAL

S:\GIS\ARCPRJ2\010116\PLT\SIUF_OU2_ERA\SIUF_OU2_ERA_FIG4-2_CUEXC_REV.MXD

Legend

Outfalls/Sampling Areas

Abandoned

Active

Copper Exceedances

Result (mg/kg DW)

<36 (Background)

36.1 - 50 (1x Invert SLV)

50.1 - 250 (5x Invert SLV)

>250

Approximate OU2 Boundary

Approximate OU4 Boundary

Approximate OU1 Boundary

Riverbank Sampling Locations

Notes:
- OU = Operable Unit
- Composite samples are comprised of combining discrete samples but are presented as separate points on figure, so as to be able to present results for those samples.
- Aerial photography - July 2007
- Boundaries and sampling locations are approximate; based on information provided by Ash Creek Associates.
-Level II Screening Level Values (SLVs) from Oregon Department of Environmental Quality (DEQ), Table 1, Guidance for Ecological Risk Assessment, December 2001.
- Background (bkg) values from Oregon DEQ Toxicology Workgroup Memorandum to DEQ Cleanup Project Managers regarding "Default background concentrations for metals". October 28, 2002.

Feet

0 100 200

SWAN ISLAND UPLAND FACILITY
PORT OF PORTLAND, OREGON

FIGURE 4-2

SWAN ISLAND UPLAND FACILITY
OPERABLE UNIT 2
INVERTEBRATE SCREENING
LEVEL EXCEEDANCES - COPPER

PRJ: 007-013
REV: 0

DATE: MAR 30, 2010
BY: RCR CHK: MCL

FORMATION ENVIRONMENTAL

APPENDIX A
Level I Scoping Ecological Risk Assessment, Swan Island Upland Facility, Operable Unit 2 (February 2006), with Subsequent Letters and Attachments

APPENDIX B
Riverbank Area Surface Soil Results

APPENDIX B Riverbank Area Surface Soil Results

Swan Island OU2 Upland Facility

Sample ID	Sample Date	Lower Depth (feet bgs)	Analyte	Result	Units	Qualifier
PS-S-01-01	1/1/1998	2	Aroclor 1016	50	ug/kg	U
PS-S-01-01	1/1/1998	2	Aroclor 1221	50	ug/kg	U
PS-S-01-01	1/1/1998	2	Aroclor 1232	50	ug/kg	U
PS-S-01-01	1/1/1998	2	Aroclor 1242	50	ug/kg	U
PS-S-01-01	1/1/1998	2	Aroclor 1248	50	ug/kg	U
PS-S-01-01	1/1/1998	2	Aroclor 1254	50	ug/kg	U
PS-S-01-01	1/1/1998	2	Aroclor 1260	50	ug/kg	U
PS-S-01-01	1/1/1998	2	Arsenic	2.71	mg/kg	
PS-S-01-01	1/1/1998	2	Barium	81.3	mg/kg	
PS-S-01-01	1/1/1998	2	Cadmium	0.5	mg/kg	U
PS-S-01-01	1/1/1998	2	Chromium	12.5	mg/kg	
PS-S-01-01	1/1/1998	2	Heavy Oil Range Hydrocarbons	100	mg/kg	U
PS-S-01-01	1/1/1998	2	Lead	11.6	mg/kg	
PS-S-01-01	1/1/1998	2	Mercury	0.1	mg/kg	U
PS-S-01-01	1/1/1998	2	Selenium	0.5	mg/kg	U
PS-S-01-01	1/1/1998	2	Silver	0.5	mg/kg	U
RB-1 Composite	9/26/2006	0.5	2-Methylnaphthalene	4	ug/kg	
RB-1 Composite	9/26/2006	0.5	Acenaphthene	2.7	ug/kg	<
RB-1 Composite	9/26/2006	0.5	Acenaphthylene	41	ug/kg	
RB-1 Composite	9/26/2006	0.5	Anthracene	14	ug/kg	
RB-1 Composite	9/26/2006	0.5	Antimony	0.93	mg/kg	
RB-1 Composite	9/26/2006	0.5	Aroclor 1016	54	ug/kg	<
RB-1 Composite	9/26/2006	0.5	Aroclor 1221	110	ug/kg	<
RB-1 Composite	9/26/2006	0.5	Aroclor 1232	54	ug/kg	<
RB-1 Composite	9/26/2006	0.5	Aroclor 1242	54	ug/kg	<
RB-1 Composite	9/26/2006	0.5	Aroclor 1248	54	ug/kg	<
RB-1 Composite	9/26/2006	0.5	Aroclor 1254	54	ug/kg	<
RB-1 Composite	9/26/2006	0.5	Aroclor 1260	72	ug/kg	
RB-1 Composite	9/26/2006	0.5	Arsenic	12.2	mg/kg	
RB-1 Composite	9/26/2006	0.5	Benz(a)anthracene	68	ug/kg	
RB-1 Composite	9/26/2006	0.5	Benzo(a)pyrene	170	ug/kg	
RB-1 Composite	9/26/2006	0.5	Benzo(b)fluoranthene	210	ug/kg	
RB-1 Composite	9/26/2006	0.5	Benzo(g,h,i)perylene	360	ug/kg	
RB-1 Composite	9/26/2006	0.5	Benzo(k)fluoranthene	160	ug/kg	
RB-1 Composite	9/26/2006	0.5	Cadmium	1.04	mg/kg	
RB-1 Composite	9/26/2006	0.5	Chromium	29	mg/kg	
RB-1 Composite	9/26/2006	0.5	Chrysene	160	ug/kg	
RB-1 Composite	9/26/2006	0.5	Copper	271	mg/kg	
RB-1 Composite	9/26/2006	0.5	Dibenz(a,h)anthracene	22	ug/kg	
RB-1 Composite	9/26/2006	0.5	Dibenzofuran	2.7	ug/kg	<
RB-1 Composite	9/26/2006	0.5	Diesel	-9999	mg/kg	DET

APPENDIX B Riverbank Area Surface Soil Results

Swan Island OU2 Upland Facility

Sample ID	Sample Date	Lower Depth (feet bgs)	Analyte	Result	Units	Qualifier
RB-1 Composite	9/26/2006	0.5	Diesel	76	mg/kg	
RB-1 Composite	9/26/2006	0.5	Fluoranthene	160	ug/kg	
RB-1 Composite	9/26/2006	0.5	Fluorene	2.7	ug/kg	<
RB-1 Composite	9/26/2006	0.5	Gasoline	20	mg/kg	<
RB-1 Composite	9/26/2006	0.5	Indeno(1,2,3-cd)pyrene	290	ug/kg	
RB-1 Composite	9/26/2006	0.5	Lead	85.6	mg/kg	
RB-1 Composite	9/26/2006	0.5	Naphthalene	7.9	ug/kg	
RB-1 Composite	9/26/2006	0.5	Nickel	26.8	mg/kg	
RB-1 Composite	9/26/2006	0.5	Oil	-9999	mg/kg	DET
RB-1 Composite	9/26/2006	0.5	Oil	450	mg/kg	
RB-1 Composite	9/26/2006	0.5	Phenanthrene	37	ug/kg	
RB-1 Composite	9/26/2006	0.5	Pyrene	220	ug/kg	
RB-1 Composite	9/26/2006	0.5	Silver	0.19	mg/kg	
RB-1 Composite	9/26/2006	0.5	Total PCBs	99	ug/kg	
RB-1 Composite	9/26/2006	0.5	Zinc	835	mg/kg	
RB-1a	9/26/2006	0.5	2-Methylnaphthalene	5.6	ug/kg	
RB-1a	9/26/2006	0.5	Acenaphthene	3.1	ug/kg	
RB-1a	9/26/2006	0.5	Acenaphthylene	28	ug/kg	
RB-1a	9/26/2006	0.5	Anthracene	12	ug/kg	
RB-1a	9/26/2006	0.5	Benz(a)anthracene	61	ug/kg	
RB-1a	9/26/2006	0.5	Benzo(a)pyrene	140	ug/kg	
RB-1a	9/26/2006	0.5	Benzo(b)fluoranthene	140	ug/kg	
RB-1a	9/26/2006	0.5	Benzo(g,h,i)perylene	260	ug/kg	
RB-1a	9/26/2006	0.5	Benzo(k)fluoranthene	110	ug/kg	
RB-1a	9/26/2006	0.5	Chrysene	120	ug/kg	
RB-1a	9/26/2006	0.5	Dibenz(a,h)anthracene	21	ug/kg	
RB-1a	9/26/2006	0.5	Dibenzofuran	2.9	ug/kg	
RB-1a	9/26/2006	0.5	Fluoranthene	150	ug/kg	
RB-1a	9/26/2006	0.5	Fluorene	2.8	ug/kg	<
RB-1a	9/26/2006	0.5	Indeno(1,2,3-cd)pyrene	210	ug/kg	
RB-1a	9/26/2006	0.5	Naphthalene	11	ug/kg	
RB-1a	9/26/2006	0.5	Phenanthrene	46	ug/kg	
RB-1a	9/26/2006	0.5	Pyrene	220	ug/kg	
RB-1b	9/26/2006	0.5	2-Methylnaphthalene	4	ug/kg	
RB-1b	9/26/2006	0.5	Acenaphthene	2.7	ug/kg	<
RB-1b	9/26/2006	0.5	Acenaphthylene	34	ug/kg	
RB-1b	9/26/2006	0.5	Anthracene	13	ug/kg	
RB-1b	9/26/2006	0.5	Benz(a)anthracene	69	ug/kg	
RB-1b	9/26/2006	0.5	Benzo(a)pyrene	180	ug/kg	
RB-1b	9/26/2006	0.5	Benzo(b)fluoranthene	220	ug/kg	

APPENDIX B Riverbank Area Surface Soil Results

Swan Island OU2 Upland Facility

Sample ID	Sample Date	Lower Depth (feet bgs)	Analyte	Result	Units	Qualifier
RB-1b	9/26/2006	0.5	Benzo(g,h,i)perylene	330	ug/kg	
RB-1b	9/26/2006	0.5	Benzo(k)fluoranthene	140	ug/kg	
RB-1b	9/26/2006	0.5	Chrysene	160	ug/kg	
RB-1b	9/26/2006	0.5	Dibenz(a,h)anthracene	30	ug/kg	
RB-1b	9/26/2006	0.5	Dibenzofuran	2.7	ug/kg	<
RB-1b	9/26/2006	0.5	Fluoranthene	150	ug/kg	
RB-1b	9/26/2006	0.5	Fluorene	2.7	ug/kg	<
RB-1b	9/26/2006	0.5	Indeno(1,2,3-cd)pyrene	270	ug/kg	
RB-1b	9/26/2006	0.5	Naphthalene	7.4	ug/kg	
RB-1b	9/26/2006	0.5	Phenanthrene	33	ug/kg	
RB-1b	9/26/2006	0.5	Pyrene	240	ug/kg	
RB-1c	9/26/2006	0.5	2-Methylnaphthalene	3.6	ug/kg	
RB-1c	9/26/2006	0.5	Acenaphthene	2.9	ug/kg	
RB-1c	9/26/2006	0.5	Acenaphthylene	28	ug/kg	
RB-1c	9/26/2006	0.5	Anthracene	14	ug/kg	
RB-1c	9/26/2006	0.5	Benz(a)anthracene	63	ug/kg	
RB-1c	9/26/2006	0.5	Benzo(a)pyrene	150	ug/kg	
RB-1c	9/26/2006	0.5	Benzo(b)fluoranthene	180	ug/kg	
RB-1c	9/26/2006	0.5	Benzo(g,h,i)perylene	260	ug/kg	
RB-1c	9/26/2006	0.5	Benzo(k)fluoranthene	120	ug/kg	
RB-1c	9/26/2006	0.5	Chrysene	140	ug/kg	
RB-1c	9/26/2006	0.5	Dibenz(a,h)anthracene	25	ug/kg	
RB-1c	9/26/2006	0.5	Dibenzofuran	2.7	ug/kg	
RB-1c	9/26/2006	0.5	Fluoranthene	150	ug/kg	
RB-1c	9/26/2006	0.5	Fluorene	2.6	ug/kg	
RB-1c	9/26/2006	0.5	Indeno(1,2,3-cd)pyrene	210	ug/kg	
RB-1c	9/26/2006	0.5	Naphthalene	6.9	ug/kg	
RB-1c	9/26/2006	0.5	Phenanthrene	42	ug/kg	
RB-1c	9/26/2006	0.5	Pyrene	200	ug/kg	
RB-2 Composite	9/26/2006	0.5	2-Methylnaphthalene	5.4	ug/kg	
RB-2 Composite	9/26/2006	0.5	Acenaphthene	5.1	ug/kg	
RB-2 Composite	9/26/2006	0.5	Acenaphthylene	61	ug/kg	
RB-2 Composite	9/26/2006	0.5	Anthracene	24	ug/kg	
RB-2 Composite	9/26/2006	0.5	Antimony	0.4	mg/kg	
RB-2 Composite	9/26/2006	0.5	Aroclor 1016	52	ug/kg	<
RB-2 Composite	9/26/2006	0.5	Aroclor 1221	110	ug/kg	<
RB-2 Composite	9/26/2006	0.5	Aroclor 1232	52	ug/kg	<
RB-2 Composite	9/26/2006	0.5	Aroclor 1242	52	ug/kg	<
RB-2 Composite	9/26/2006	0.5	Aroclor 1248	52	ug/kg	<
RB-2 Composite	9/26/2006	0.5	Aroclor 1254	52	ug/kg	<

APPENDIX B Riverbank Area Surface Soil Results

Swan Island OU2 Upland Facility

Sample ID	Sample Date	Lower Depth (feet bgs)	Analyte	Result	Units	Qualifier
RB-2 Composite	9/26/2006	0.5	Aroclor 1260	77	ug/kg	
RB-2 Composite	9/26/2006	0.5	Arsenic	3.8	mg/kg	
RB-2 Composite	9/26/2006	0.5	Benz(a)anthracene	140	ug/kg	
RB-2 Composite	9/26/2006	0.5	Benzo(a)pyrene	320	ug/kg	
RB-2 Composite	9/26/2006	0.5	Benzo(b)fluoranthene	310	ug/kg	
RB-2 Composite	9/26/2006	0.5	Benzo(g,h,i)perylene	490	ug/kg	
RB-2 Composite	9/26/2006	0.5	Benzo(k)fluoranthene	240	ug/kg	
RB-2 Composite	9/26/2006	0.5	Cadmium	0.46	mg/kg	
RB-2 Composite	9/26/2006	0.5	Chromium	19.9	mg/kg	
RB-2 Composite	9/26/2006	0.5	Chrysene	260	ug/kg	
RB-2 Composite	9/26/2006	0.5	Copper	92.4	mg/kg	
RB-2 Composite	9/26/2006	0.5	Dibenz(a,h)anthracene	34	ug/kg	
RB-2 Composite	9/26/2006	0.5	Dibenzofuran	3.3	ug/kg	
RB-2 Composite	9/26/2006	0.5	Diesel	28	mg/kg	
RB-2 Composite	9/26/2006	0.5	Diesel	50	mg/kg	<
RB-2 Composite	9/26/2006	0.5	Fluoranthene	330	ug/kg	
RB-2 Composite	9/26/2006	0.5	Fluorene	4.8	ug/kg	
RB-2 Composite	9/26/2006	0.5	Gasoline	20	mg/kg	<
RB-2 Composite	9/26/2006	0.5	Indeno(1,2,3-cd)pyrene	430	ug/kg	
RB-2 Composite	9/26/2006	0.5	Lead	43.2	mg/kg	
RB-2 Composite	9/26/2006	0.5	Naphthalene	9.7	ug/kg	
RB-2 Composite	9/26/2006	0.5	Nickel	16.9	mg/kg	
RB-2 Composite	9/26/2006	0.5	Oil	-9999	mg/kg	DET
RB-2 Composite	9/26/2006	0.5	Oil	230	mg/kg	
RB-2 Composite	9/26/2006	0.5	Phenanthrene	92	ug/kg	
RB-2 Composite	9/26/2006	0.5	Pyrene	430	ug/kg	
RB-2 Composite	9/26/2006	0.5	Silver	0.09	mg/kg	
RB-2 Composite	9/26/2006	0.5	Total PCBs	103	ug/kg	
RB-2 Composite	9/26/2006	0.5	Zinc	174	mg/kg	
RB-2a	9/26/2006	0.5	2-Methylnaphthalene	2.6	ug/kg	<
RB-2a	9/26/2006	0.5	Acenaphthene	2.6	ug/kg	<
RB-2a	9/26/2006	0.5	Acenaphthylene	19	ug/kg	
RB-2a	9/26/2006	0.5	Anthracene	7.2	ug/kg	
RB-2a	9/26/2006	0.5	Benz(a)anthracene	50	ug/kg	
RB-2a	9/26/2006	0.5	Benzo(a)pyrene	130	ug/kg	
RB-2a	9/26/2006	0.5	Benzo(b)fluoranthene	110	ug/kg	
RB-2a	9/26/2006	0.5	Benzo(g,h,i)perylene	180	ug/kg	
RB-2a	9/26/2006	0.5	Benzo(k)fluoranthene	85	ug/kg	
RB-2a	9/26/2006	0.5	Chrysene	95	ug/kg	
RB-2a	9/26/2006	0.5	Dibenz(a,h)anthracene	15	ug/kg	
RB-2a	9/26/2006	0.5	Dibenzofuran	2.6	ug/kg	<

APPENDIX B Riverbank Area Surface Soil Results

Swan Island OU2 Upland Facility

Sample ID	Sample Date	Lower Depth (feet bgs)	Analyte	Result	Units	Qualifier
RB-2a	9/26/2006	0.5	Fluoranthene	120	ug/kg	
RB-2a	9/26/2006	0.5	Fluorene	2.6	ug/kg	<
RB-2a	9/26/2006	0.5	Indeno(1,2,3-cd)pyrene	150	ug/kg	
RB-2a	9/26/2006	0.5	Naphthalene	4.5	ug/kg	
RB-2a	9/26/2006	0.5	Phenanthrene	22	ug/kg	
RB-2a	9/26/2006	0.5	Pyrene	170	ug/kg	
RB-2b	9/26/2006	0.5	2-Methylnaphthalene	11	ug/kg	
RB-2b	9/26/2006	0.5	Acenaphthene	11	ug/kg	
RB-2b	9/26/2006	0.5	Acenaphthylene	84	ug/kg	
RB-2b	9/26/2006	0.5	Anthracene	41	ug/kg	
RB-2b	9/26/2006	0.5	Benz(a)anthracene	230	ug/kg	
RB-2b	9/26/2006	0.5	Benzo(a)pyrene	520	ug/kg	
RB-2b	9/26/2006	0.5	Benzo(b)fluoranthene	520	ug/kg	
RB-2b	9/26/2006	0.5	Benzo(g,h,i)perylene	720	ug/kg	
RB-2b	9/26/2006	0.5	Benzo(k)fluoranthene	380	ug/kg	
RB-2b	9/26/2006	0.5	Chrysene	430	ug/kg	
RB-2b	9/26/2006	0.5	Dibenz(a,h)anthracene	77	ug/kg	
RB-2b	9/26/2006	0.5	Dibenzofuran	6.6	ug/kg	
RB-2b	9/26/2006	0.5	Fluoranthene	500	ug/kg	
RB-2b	9/26/2006	0.5	Fluorene	9.2	ug/kg	
RB-2b	9/26/2006	0.5	Indeno(1,2,3-cd)pyrene	660	ug/kg	
RB-2b	9/26/2006	0.5	Naphthalene	19	ug/kg	
RB-2b	9/26/2006	0.5	Phenanthrene	150	ug/kg	
RB-2b	9/26/2006	0.5	Pyrene	690	ug/kg	
RB-2c	9/26/2006	0.5	2-Methylnaphthalene	5.4	ug/kg	
RB-2c	9/26/2006	0.5	Acenaphthene	3.5	ug/kg	
RB-2c	9/26/2006	0.5	Acenaphthylene	33	ug/kg	
RB-2c	9/26/2006	0.5	Anthracene	16	ug/kg	
RB-2c	9/26/2006	0.5	Benz(a)anthracene	110	ug/kg	
RB-2c	9/26/2006	0.5	Benzo(a)pyrene	230	ug/kg	
RB-2c	9/26/2006	0.5	Benzo(b)fluoranthene	230	ug/kg	
RB-2c	9/26/2006	0.5	Benzo(g,h,i)perylene	330	ug/kg	
RB-2c	9/26/2006	0.5	Benzo(k)fluoranthene	160	ug/kg	
RB-2c	9/26/2006	0.5	Chrysene	190	ug/kg	
RB-2c	9/26/2006	0.5	Dibenz(a,h)anthracene	36	ug/kg	
RB-2c	9/26/2006	0.5	Dibenzofuran	3.4	ug/kg	
RB-2c	9/26/2006	0.5	Fluoranthene	230	ug/kg	
RB-2c	9/26/2006	0.5	Fluorene	2.8	ug/kg	
RB-2c	9/26/2006	0.5	Indeno(1,2,3-cd)pyrene	270	ug/kg	

APPENDIX B Riverbank Area Surface Soil Results

Swan Island OU2 Upland Facility

Sample ID	Sample Date	Lower Depth (feet bgs)	Analyte	Result	Units	Qualifier
RB-2c	9/26/2006	0.5	Naphthalene	10	ug/kg	
RB-2c	9/26/2006	0.5	Phenanthrene	58	ug/kg	
RB-2c	9/26/2006	0.5	Pyrene	350	ug/kg	
RB-3 Composite	9/26/2006	0.5	2-Methylnaphthalene	3.5	ug/kg	
RB-3 Composite	9/26/2006	0.5	Acenaphthene	2.8	ug/kg	<
RB-3 Composite	9/26/2006	0.5	Acenaphthylene	16	ug/kg	
RB-3 Composite	9/26/2006	0.5	Anthracene	9.1	ug/kg	
RB-3 Composite	9/26/2006	0.5	Antimony	0.35	mg/kg	
RB-3 Composite	9/26/2006	0.5	Aroclor 1016	55	ug/kg	<
RB-3 Composite	9/26/2006	0.5	Aroclor 1221	110	ug/kg	<
RB-3 Composite	9/26/2006	0.5	Aroclor 1232	55	ug/kg	<
RB-3 Composite	9/26/2006	0.5	Aroclor 1242	55	ug/kg	<
RB-3 Composite	9/26/2006	0.5	Aroclor 1248	55	ug/kg	<
RB-3 Composite	9/26/2006	0.5	Aroclor 1254	55	ug/kg	<
RB-3 Composite	9/26/2006	0.5	Aroclor 1260	55	ug/kg	<
RB-3 Composite	9/26/2006	0.5	Arsenic	7	mg/kg	
RB-3 Composite	9/26/2006	0.5	Benz(a)anthracene	45	ug/kg	
RB-3 Composite	9/26/2006	0.5	Benzo(a)pyrene	94	ug/kg	
RB-3 Composite	9/26/2006	0.5	Benzo(b)fluoranthene	87	ug/kg	
RB-3 Composite	9/26/2006	0.5	Benzo(g,h,i)perylene	150	ug/kg	
RB-3 Composite	9/26/2006	0.5	Benzo(k)fluoranthene	70	ug/kg	
RB-3 Composite	9/26/2006	0.5	Cadmium	0.48	mg/kg	
RB-3 Composite	9/26/2006	0.5	Chromium	22	mg/kg	
RB-3 Composite	9/26/2006	0.5	Chrysene	82	ug/kg	
RB-3 Composite	9/26/2006	0.5	Copper	96.3	mg/kg	
RB-3 Composite	9/26/2006	0.5	Dibenz(a,h)anthracene	11	ug/kg	
RB-3 Composite	9/26/2006	0.5	Dibenzofuran	2.8	ug/kg	<
RB-3 Composite	9/26/2006	0.5	Diesel	-9999	mg/kg	DET
RB-3 Composite	9/26/2006	0.5	Diesel	100	mg/kg	
RB-3 Composite	9/26/2006	0.5	Fluoranthene	100	ug/kg	
RB-3 Composite	9/26/2006	0.5	Fluorene	2.8	ug/kg	<
RB-3 Composite	9/26/2006	0.5	Gasoline	20	mg/kg	<
RB-3 Composite	9/26/2006	0.5	Indeno(1,2,3-cd)pyrene	120	ug/kg	
RB-3 Composite	9/26/2006	0.5	Lead	36	mg/kg	
RB-3 Composite	9/26/2006	0.5	Naphthalene	6.3	ug/kg	
RB-3 Composite	9/26/2006	0.5	Nickel	20.3	mg/kg	
RB-3 Composite	9/26/2006	0.5	Oil	-9999	mg/kg	DET
RB-3 Composite	9/26/2006	0.5	Oil	820	mg/kg	
RB-3 Composite	9/26/2006	0.5	Phenanthrene	31	ug/kg	
RB-3 Composite	9/26/2006	0.5	Pyrene	130	ug/kg	
RB-3 Composite	9/26/2006	0.5	Silver	0.14	mg/kg	

APPENDIX B Riverbank Area Surface Soil Results

Swan Island OU2 Upland Facility

Sample ID	Sample Date	Lower Depth (feet bgs)	Analyte	Result	Units	Qualifier
RB-3 Composite	9/26/2006	0.5	Total PCBs	55	ug/kg	
RB-3 Composite	9/26/2006	0.5	Zinc	264	mg/kg	
RB-3a	9/26/2006	0.5	2-Methylnaphthalene	4.8	ug/kg	
RB-3a	9/26/2006	0.5	Acenaphthene	2.6	ug/kg	<
RB-3a	9/26/2006	0.5	Acenaphthylene	15	ug/kg	
RB-3a	9/26/2006	0.5	Anthracene	9	ug/kg	
RB-3a	9/26/2006	0.5	Benz(a)anthracene	36	ug/kg	
RB-3a	9/26/2006	0.5	Benzo(a)pyrene	79	ug/kg	
RB-3a	9/26/2006	0.5	Benzo(b)fluoranthene	76	ug/kg	
RB-3a	9/26/2006	0.5	Benzo(g,h,i)perylene	130	ug/kg	
RB-3a	9/26/2006	0.5	Benzo(k)fluoranthene	61	ug/kg	
RB-3a	9/26/2006	0.5	Chrysene	69	ug/kg	
RB-3a	9/26/2006	0.5	Dibenz(a,h)anthracene	14	ug/kg	
RB-3a	9/26/2006	0.5	Dibenzofuran	4.3	ug/kg	
RB-3a	9/26/2006	0.5	Fluoranthene	93	ug/kg	
RB-3a	9/26/2006	0.5	Fluorene	2.6	ug/kg	<
RB-3a	9/26/2006	0.5	Indeno(1,2,3-cd)pyrene	110	ug/kg	
RB-3a	9/26/2006	0.5	Naphthalene	6.8	ug/kg	
RB-3a	9/26/2006	0.5	Phenanthrene	36	ug/kg	
RB-3a	9/26/2006	0.5	Pyrene	120	ug/kg	
RB-3b	9/26/2006	0.5	2-Methylnaphthalene	2.8	ug/kg	<
RB-3b	9/26/2006	0.5	Acenaphthene	2.8	ug/kg	<
RB-3b	9/26/2006	0.5	Acenaphthylene	8.8	ug/kg	
RB-3b	9/26/2006	0.5	Anthracene	5.5	ug/kg	
RB-3b	9/26/2006	0.5	Benz(a)anthracene	40	ug/kg	
RB-3b	9/26/2006	0.5	Benzo(a)pyrene	64	ug/kg	
RB-3b	9/26/2006	0.5	Benzo(b)fluoranthene	69	ug/kg	
RB-3b	9/26/2006	0.5	Benzo(g,h,i)perylene	87	ug/kg	
RB-3b	9/26/2006	0.5	Benzo(k)fluoranthene	57	ug/kg	
RB-3b	9/26/2006	0.5	Chrysene	62	ug/kg	
RB-3b	9/26/2006	0.5	Dibenz(a,h)anthracene	14	ug/kg	
RB-3b	9/26/2006	0.5	Dibenzofuran	2.8	ug/kg	<
RB-3b	9/26/2006	0.5	Fluoranthene	59	ug/kg	
RB-3b	9/26/2006	0.5	Fluorene	2.8	ug/kg	<
RB-3b	9/26/2006	0.5	Indeno(1,2,3-cd)pyrene	80	ug/kg	
RB-3b	9/26/2006	0.5	Naphthalene	3.5	ug/kg	
RB-3b	9/26/2006	0.5	Phenanthrene	17	ug/kg	
RB-3b	9/26/2006	0.5	Pyrene	83	ug/kg	
RB-3c	9/26/2006	0.5	2-Methylnaphthalene	12	ug/kg	
RB-3c	9/26/2006	0.5	Acenaphthene	17	ug/kg	

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Sample ID	Sample Date	Lower Depth (feet bgs)	Analyte	Result	Units	Qualifier
RB-3c	9/26/2006	0.5	Acenaphthylene	23	ug/kg	
RB-3c	9/26/2006	0.5	Anthracene	49	ug/kg	
RB-3c	9/26/2006	0.5	Benz(a)anthracene	110	ug/kg	
RB-3c	9/26/2006	0.5	Benzo(a)pyrene	180	ug/kg	
RB-3c	9/26/2006	0.5	Benzo(b)fluoranthene	170	ug/kg	
RB-3c	9/26/2006	0.5	Benzo(g,h,i)perylene	190	ug/kg	
RB-3c	9/26/2006	0.5	Benzo(k)fluoranthene	110	ug/kg	
RB-3c	9/26/2006	0.5	Chrysene	210	ug/kg	
RB-3c	9/26/2006	0.5	Dibenz(a,h)anthracene	35	ug/kg	
RB-3c	9/26/2006	0.5	Dibenzofuran	7.1	ug/kg	
RB-3c	9/26/2006	0.5	Fluoranthene	210	ug/kg	
RB-3c	9/26/2006	0.5	Fluorene	15	ug/kg	
RB-3c	9/26/2006	0.5	Indeno(1,2,3-cd)pyrene	160	ug/kg	
RB-3c	9/26/2006	0.5	Naphthalene	13	ug/kg	
RB-3c	9/26/2006	0.5	Phenanthrene	190	ug/kg	
RB-3c	9/26/2006	0.5	Pyrene	290	ug/kg	
RB-4 Composite	10/1/2008	0.5	2-Methylnaphthalene	6.4	ug/kg	
RB-4 Composite	10/1/2008	0.5	Acenaphthene	8.9	ug/kg	
RB-4 Composite	10/1/2008	0.5	Acenaphthylene	1.8	ug/kg	J
RB-4 Composite	10/1/2008	0.5	Anthracene	9.3	ug/kg	
RB-4 Composite	10/1/2008	0.5	Antimony	0.35	mg/kg	
RB-4 Composite	10/1/2008	0.5	Aroclor 1016	10	ug/kg	<
RB-4 Composite	10/1/2008	0.5	Aroclor 1221	20	ug/kg	<
RB-4 Composite	10/1/2008	0.5	Aroclor 1232	10	ug/kg	<
RB-4 Composite	10/1/2008	0.5	Aroclor 1242	10	ug/kg	<
RB-4 Composite	10/1/2008	0.5	Aroclor 1248	10	ug/kg	<
RB-4 Composite	10/1/2008	0.5	Aroclor 1254	23	ug/kg	
RB-4 Composite	10/1/2008	0.5	Aroclor 1260	68	ug/kg	
RB-4 Composite	10/1/2008	0.5	Aroclor 1262	10	ug/kg	<
RB-4 Composite	10/1/2008	0.5	Aroclor 1268	10	ug/kg	<
RB-4 Composite	10/1/2008	0.5	Arsenic	3.4	mg/kg	
RB-4 Composite	10/1/2008	0.5	Benz(a)anthracene	45	ug/kg	
RB-4 Composite	10/1/2008	0.5	Benzo(a)pyrene	70	ug/kg	
RB-4 Composite	10/1/2008	0.5	Benzo(b)fluoranthene	100	ug/kg	
RB-4 Composite	10/1/2008	0.5	Benzo(g,h,i)perylene	81	ug/kg	
RB-4 Composite	10/1/2008	0.5	Benzo(k)fluoranthene	33	ug/kg	
RB-4 Composite	10/1/2008	0.5	Bis(2-ethylhexyl) Phthalate	360	ug/kg	JD
RB-4 Composite	10/1/2008	0.5	Butyl Benzyl Phthalate	120	ug/kg	D
RB-4 Composite	10/1/2008	0.5	Cadmium	0.238	mg/kg	
RB-4 Composite	10/1/2008	0.5	Chromium	13.6	mg/kg	

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Sample ID	Sample Date	Lower Depth (feet bgs)	Analyte	Result	Units	Qualifier
RB-4 Composite	10/1/2008	0.5	Chrysene	79	ug/kg	
RB-4 Composite	10/1/2008	0.5	Copper	65.9	mg/kg	
RB-4 Composite	10/1/2008	0.5	Dibenz(a,h)anthracene	15	ug/kg	
RB-4 Composite	10/1/2008	0.5	Dibenzofuran	10	ug/kg	
RB-4 Composite	10/1/2008	0.5	Diesel	41	mg/kg	H
RB-4 Composite	10/1/2008	0.5	Diethyl Phthalate	100	ug/kg	<
RB-4 Composite	10/1/2008	0.5	Dimethyl Phthalate	100	ug/kg	<
RB-4 Composite	10/1/2008	0.5	Di-n-butyl Phthalate	200	ug/kg	<
RB-4 Composite	10/1/2008	0.5	Di-n-octyl Phthalate	100	ug/kg	<
RB-4 Composite	10/1/2008	0.5	Fluoranthene	120	ug/kg	
RB-4 Composite	10/1/2008	0.5	Fluorene	7.6	ug/kg	
RB-4 Composite	10/1/2008	0.5	Gasoline	5.5	mg/kg	<
RB-4 Composite	10/1/2008	0.5	Indeno(1,2,3-cd)pyrene	77	ug/kg	
RB-4 Composite	10/1/2008	0.5	Lead	41.3	mg/kg	
RB-4 Composite	10/1/2008	0.5	Naphthalene	9.2	ug/kg	
RB-4 Composite	10/1/2008	0.5	Nickel	15	mg/kg	
RB-4 Composite	10/1/2008	0.5	Oil	380	mg/kg	O
RB-4 Composite	10/1/2008	0.5	Phenanthrene	87	ug/kg	
RB-4 Composite	10/1/2008	0.5	Pyrene	120	ug/kg	
RB-4 Composite	10/1/2008	0.5	Silver	0.05	mg/kg	
RB-4 Composite	10/1/2008	0.5	Total PCBs	91	ug/kg	
RB-4 Composite	10/1/2008	0.5	Tri-n-butyltin	130	ug/kg	D
RB-4 Composite	10/1/2008	0.5	Zinc	153	mg/kg	
RB-4a	10/1/2008	0.5	Lead	27.2	mg/kg	
RB-4a	10/1/2008	0.5	Tri-n-butyltin	67	ug/kg	
RB-4b	10/1/2008	0.5	Lead	170	mg/kg	
RB-4b	10/1/2008	0.5	Tri-n-butyltin	580	ug/kg	D
RB-4c	10/1/2008	0.5	Lead	91.4	mg/kg	
RB-4c	10/1/2008	0.5	Tri-n-butyltin	5	ug/kg	<
RB-5 Composite	10/1/2008	0.5	2-Methylnaphthalene	23	ug/kg	
RB-5 Composite	10/1/2008	0.5	Acenaphthene	0.87	ug/kg	J
RB-5 Composite	10/1/2008	0.5	Acenaphthylene	2.2	ug/kg	J
RB-5 Composite	10/1/2008	0.5	Anthracene	3.5	ug/kg	J
RB-5 Composite	10/1/2008	0.5	Antimony	0.37	mg/kg	
RB-5 Composite	10/1/2008	0.5	Aroclor 1016	10	ug/kg	<
RB-5 Composite	10/1/2008	0.5	Aroclor 1221	20	ug/kg	< i
RB-5 Composite	10/1/2008	0.5	Aroclor 1232	10	ug/kg	< i
RB-5 Composite	10/1/2008	0.5	Aroclor 1242	10	ug/kg	< i
RB-5 Composite	10/1/2008	0.5	Aroclor 1248	10	ug/kg	< i
RB-5 Composite	10/1/2008	0.5	Aroclor 1254	10	ug/kg	<
RB-5 Composite	10/1/2008	0.5	Aroclor 1260	53	ug/kg	

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Sample ID	Sample Date	Lower Depth (feet bgs)	Analyte	Result	Units	Qualifier
RB-5 Composite	10/1/2008	0.5	Aroclor 1262	10	ug/kg	<
RB-5 Composite	10/1/2008	0.5	Aroclor 1268	10	ug/kg	<
RB-5 Composite	10/1/2008	0.5	Arsenic	2.7	mg/kg	
RB-5 Composite	10/1/2008	0.5	Benz(a)anthracene	23	ug/kg	
RB-5 Composite	10/1/2008	0.5	Benzo(a)pyrene	42	ug/kg	
RB-5 Composite	10/1/2008	0.5	Benzo(b)fluoranthene	61	ug/kg	
RB-5 Composite	10/1/2008	0.5	Benzo(g,h,i)perylene	64	ug/kg	
RB-5 Composite	10/1/2008	0.5	Benzo(k)fluoranthene	15	ug/kg	
RB-5 Composite	10/1/2008	0.5	Bis(2-ethylhexyl) Phthalate	30	ug/kg	J
RB-5 Composite	10/1/2008	0.5	Butyl Benzyl Phthalate	8.8	ug/kg	J
RB-5 Composite	10/1/2008	0.5	Cadmium	0.763	mg/kg	
RB-5 Composite	10/1/2008	0.5	Chromium	13.8	mg/kg	
RB-5 Composite	10/1/2008	0.5	Chrysene	27	ug/kg	
RB-5 Composite	10/1/2008	0.5	Copper	33.3	mg/kg	
RB-5 Composite	10/1/2008	0.5	Dibenz(a,h)anthracene	21	ug/kg	
RB-5 Composite	10/1/2008	0.5	Dibenzofuran	5.6	ug/kg	
RB-5 Composite	10/1/2008	0.5	Diesel	3.2	mg/kg	J
RB-5 Composite	10/1/2008	0.5	Diethyl Phthalate	2.1	ug/kg	J
RB-5 Composite	10/1/2008	0.5	Dimethyl Phthalate	10	ug/kg	<
RB-5 Composite	10/1/2008	0.5	Di-n-butyl Phthalate	20	ug/kg	<
RB-5 Composite	10/1/2008	0.5	Di-n-octyl Phthalate	10	ug/kg	<
RB-5 Composite	10/1/2008	0.5	Fluoranthene	32	ug/kg	
RB-5 Composite	10/1/2008	0.5	Fluorene	0.68	ug/kg	J
RB-5 Composite	10/1/2008	0.5	Gasoline	5.5	mg/kg	<
RB-5 Composite	10/1/2008	0.5	Indeno(1,2,3-cd)pyrene	46	ug/kg	
RB-5 Composite	10/1/2008	0.5	Lead	20.1	mg/kg	
RB-5 Composite	10/1/2008	0.5	Naphthalene	23	ug/kg	
RB-5 Composite	10/1/2008	0.5	Nickel	17.9	mg/kg	
RB-5 Composite	10/1/2008	0.5	Oil	27	mg/kg	J
RB-5 Composite	10/1/2008	0.5	Phenanthrene	20	ug/kg	
RB-5 Composite	10/1/2008	0.5	Pyrene	46	ug/kg	
RB-5 Composite	10/1/2008	0.5	Silver	0.04	mg/kg	
RB-5 Composite	10/1/2008	0.5	Total PCBs	58	ug/kg	
RB-5 Composite	10/1/2008	0.5	Tri-n-butyltin	17	ug/kg	
RB-5 Composite	10/1/2008	0.5	Zinc	246	mg/kg	
RB-5a	10/1/2008	0.5	Lead	30.1	mg/kg	
RB-5a	10/1/2008	0.5	Tri-n-butyltin	32	ug/kg	
RB-5b	10/1/2008	0.5	Lead	15.2	mg/kg	
RB-5b	10/1/2008	0.5	Tri-n-butyltin	4.9	ug/kg	<
RB-5c	10/1/2008	0.5	Lead	6.94	mg/kg	

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Sample ID	Sample Date	Lower Depth (feet bgs)	Analyte	Result	Units	Qualifier
RB-5c	10/1/2008	0.5	Tri-n-butyltin	5	ug/kg	<
RB-6 Composite	10/1/2008	0.5	2-Methylnaphthalene	2.1	ug/kg	J
RB-6 Composite	10/1/2008	0.5	Acenaphthene	1.2	ug/kg	J
RB-6 Composite	10/1/2008	0.5	Acenaphthylene	2	ug/kg	J
RB-6 Composite	10/1/2008	0.5	Anthracene	2.2	ug/kg	J
RB-6 Composite	10/1/2008	0.5	Antimony	0.27	mg/kg	
RB-6 Composite	10/1/2008	0.5	Aroclor 1016	10	ug/kg	<
RB-6 Composite	10/1/2008	0.5	Aroclor 1221	20	ug/kg	< i
RB-6 Composite	10/1/2008	0.5	Aroclor 1232	10	ug/kg	< i
RB-6 Composite	10/1/2008	0.5	Aroclor 1242	10	ug/kg	<
RB-6 Composite	10/1/2008	0.5	Aroclor 1248	10	ug/kg	< i
RB-6 Composite	10/1/2008	0.5	Aroclor 1254	10	ug/kg	<
RB-6 Composite	10/1/2008	0.5	Aroclor 1260	78	ug/kg	
RB-6 Composite	10/1/2008	0.5	Aroclor 1262	10	ug/kg	<
RB-6 Composite	10/1/2008	0.5	Aroclor 1268	10	ug/kg	<
RB-6 Composite	10/1/2008	0.5	Arsenic	3.1	mg/kg	
RB-6 Composite	10/1/2008	0.5	Benz(a)anthracene	17	ug/kg	
RB-6 Composite	10/1/2008	0.5	Benzo(a)pyrene	29	ug/kg	
RB-6 Composite	10/1/2008	0.5	Benzo(b)fluoranthene	35	ug/kg	
RB-6 Composite	10/1/2008	0.5	Benzo(g,h,i)perylene	33	ug/kg	
RB-6 Composite	10/1/2008	0.5	Benzo(k)fluoranthene	12	ug/kg	
RB-6 Composite	10/1/2008	0.5	Bis(2-ethylhexyl) Phthalate	81	ug/kg	JD
RB-6 Composite	10/1/2008	0.5	Butyl Benzyl Phthalate	100	ug/kg	<
RB-6 Composite	10/1/2008	0.5	Cadmium	1.11	mg/kg	
RB-6 Composite	10/1/2008	0.5	Chromium	14.9	mg/kg	
RB-6 Composite	10/1/2008	0.5	Chrysene	26	ug/kg	
RB-6 Composite	10/1/2008	0.5	Copper	57.7	mg/kg	
RB-6 Composite	10/1/2008	0.5	Dibenz(a,h)anthracene	5.7	ug/kg	
RB-6 Composite	10/1/2008	0.5	Dibenzofuran	0.99	ug/kg	J
RB-6 Composite	10/1/2008	0.5	Diesel	5.9	mg/kg	J
RB-6 Composite	10/1/2008	0.5	Diethyl Phthalate	100	ug/kg	<
RB-6 Composite	10/1/2008	0.5	Dimethyl Phthalate	100	ug/kg	<
RB-6 Composite	10/1/2008	0.5	Di-n-butyl Phthalate	200	ug/kg	<
RB-6 Composite	10/1/2008	0.5	Di-n-octyl Phthalate	100	ug/kg	<
RB-6 Composite	10/1/2008	0.5	Fluoranthene	34	ug/kg	
RB-6 Composite	10/1/2008	0.5	Fluorene	0.93	ug/kg	J
RB-6 Composite	10/1/2008	0.5	Gasoline	6.2	mg/kg	<
RB-6 Composite	10/1/2008	0.5	Indeno(1,2,3-cd)pyrene	30	ug/kg	
RB-6 Composite	10/1/2008	0.5	Lead	42.6	mg/kg	
RB-6 Composite	10/1/2008	0.5	Naphthalene	5.6	ug/kg	

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Sample ID	Sample Date	Lower Depth (feet bgs)	Analyte	Result	Units	Qualifier
RB-6 Composite	10/1/2008	0.5	Nickel	16.6	mg/kg	
RB-6 Composite	10/1/2008	0.5	Oil	75	mg/kg	J
RB-6 Composite	10/1/2008	0.5	Phenanthrene	15	ug/kg	
RB-6 Composite	10/1/2008	0.5	Pyrene	38	ug/kg	
RB-6 Composite	10/1/2008	0.5	Silver	0.06	mg/kg	
RB-6 Composite	10/1/2008	0.5	Total PCBs	83	ug/kg	
RB-6 Composite	10/1/2008	0.5	Tri-n-butyltin	120	ug/kg	
RB-6 Composite	10/1/2008	0.5	Zinc	359	mg/kg	
RB-6a	10/1/2008	0.5	Lead	58.2	mg/kg	
RB-6a	10/1/2008	0.5	Tri-n-butyltin	380	ug/kg	D
RB-6b	10/1/2008	0.5	Lead	87.5	mg/kg	
RB-6b	10/1/2008	0.5	Tri-n-butyltin	7	ug/kg	
RB-6c	10/1/2008	0.5	Lead	33.6	mg/kg	
RB-6c	10/1/2008	0.5	Tri-n-butyltin	4.9	ug/kg	<
RB-7 Composite	10/1/2008	0.5	2-Methylnaphthalene	2.7	ug/kg	J
RB-7 Composite	10/1/2008	0.5	Acenaphthene	0.69	ug/kg	J
RB-7 Composite	10/1/2008	0.5	Acenaphthylene	4.1	ug/kg	J
RB-7 Composite	10/1/2008	0.5	Anthracene	4.5	ug/kg	J
RB-7 Composite	10/1/2008	0.5	Antimony	0.63	mg/kg	
RB-7 Composite	10/1/2008	0.5	Aroclor 1016	10	ug/kg	<
RB-7 Composite	10/1/2008	0.5	Aroclor 1221	20	ug/kg	<
RB-7 Composite	10/1/2008	0.5	Aroclor 1232	10	ug/kg	<
RB-7 Composite	10/1/2008	0.5	Aroclor 1242	10	ug/kg	<
RB-7 Composite	10/1/2008	0.5	Aroclor 1248	10	ug/kg	<
RB-7 Composite	10/1/2008	0.5	Aroclor 1254	14	ug/kg	P
RB-7 Composite	10/1/2008	0.5	Aroclor 1260	44	ug/kg	
RB-7 Composite	10/1/2008	0.5	Aroclor 1262	10	ug/kg	<
RB-7 Composite	10/1/2008	0.5	Aroclor 1268	10	ug/kg	<
RB-7 Composite	10/1/2008	0.5	Arsenic	2.9	mg/kg	
RB-7 Composite	10/1/2008	0.5	Benz(a)anthracene	22	ug/kg	
RB-7 Composite	10/1/2008	0.5	Benzo(a)pyrene	43	ug/kg	
RB-7 Composite	10/1/2008	0.5	Benzo(b)fluoranthene	49	ug/kg	
RB-7 Composite	10/1/2008	0.5	Benzo(g,h,i)perylene	70	ug/kg	
RB-7 Composite	10/1/2008	0.5	Benzo(k)fluoranthene	17	ug/kg	
RB-7 Composite	10/1/2008	0.5	Cadmium	0.189	mg/kg	
RB-7 Composite	10/1/2008	0.5	Chromium	22.9	mg/kg	
RB-7 Composite	10/1/2008	0.5	Chrysene	35	ug/kg	
RB-7 Composite	10/1/2008	0.5	Copper	71.3	mg/kg	
RB-7 Composite	10/1/2008	0.5	Dibenz(a,h)anthracene	12	ug/kg	
RB-7 Composite	10/1/2008	0.5	Dibenzofuran	1.1	ug/kg	J
RB-7 Composite	10/1/2008	0.5	Diesel	14	mg/kg	J
RB-7 Composite	10/1/2008	0.5	Fluoranthene	38	ug/kg	

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Sample ID	Sample Date	Lower Depth (feet bgs)	Analyte	Result	Units	Qualifier
RB-7 Composite	10/1/2008	0.5	Fluorene	0.91	ug/kg	J
RB-7 Composite	10/1/2008	0.5	Gasoline	5.8	mg/kg	<
RB-7 Composite	10/1/2008	0.5	Indeno(1,2,3-cd)pyrene	56	ug/kg	
RB-7 Composite	10/1/2008	0.5	Lead	57.5	mg/kg	
RB-7 Composite	10/1/2008	0.5	Naphthalene	8.2	ug/kg	
RB-7 Composite	10/1/2008	0.5	Nickel	24.6	mg/kg	
RB-7 Composite	10/1/2008	0.5	Oil	130	mg/kg	
RB-7 Composite	10/1/2008	0.5	Phenanthrene	16	ug/kg	
RB-7 Composite	10/1/2008	0.5	Pyrene	52	ug/kg	
RB-7 Composite	10/1/2008	0.5	Silver	0.07	mg/kg	
RB-7 Composite	10/1/2008	0.5	Total PCBs	58	ug/kg	
RB-7 Composite	10/1/2008	0.5	Zinc	121	mg/kg	
RB-7a	10/1/2008	0.5	Lead	84.2	mg/kg	
RB-7b	10/1/2008	0.5	Lead	104	mg/kg	
RB-7c	10/1/2008	0.5	Lead	18.5	mg/kg	

APPENDIX C
Riverbank Area Surface Soil Summary and Risk Screening - All Receptors

APPENDIX C-1 Riverbank Soil Summary and Risk Screening

Swan Island OU2 Upland Facility - Oregon Screening Levels (Receptors - Plants)

Constituents of Interest (COI)				Date		Depth Range (ft)		Samples			Non-detected Concentrations		Detected Concentrations		Overall Max	Background Levels[1]	Max COI Conc. Exceeds Background ?	Oregon Screening Levels[2]	COI Conc. (max)	Risk Ratio for Individual COI	Max COI Conc. Exceeds SLV - Individual COI Risk? (Q=1) (T&E)	Max COI Conc. Exceeds SLV - Individual COI Risk? (Q=5)	Risk Ratio for Multiple COIs	Max COI Conc. Exceeds SLV - Multiple COI Risk? (Q=1) (T&E)	Max COI Conc. Exceeds SLV - Multiple COI Risk? (Q=5)
CASNo	Analyte	Analyte Group/Methods	Units	Min	Max	Min	Max	Number of Samples	Number of Non-detects	Detection Frequency	Min	Max	Min	Max		Natural Background Soil Concs (mg/kg)		Plant Receptors	Cij	Tij			Tij/Tj		
7440-36-0	Antimony	Metals	mg/kg	26-Sep-06	01-Oct-08	0	0.5	7	0	100%			0.27	0.93	0.93	4	No	5	0.93	0.186	No	No	0.003	No	No
7440-38-2	Arsenic	Metals	mg/kg	01-Jan-98	01-Oct-08	0	2	8	0	100%			2.7	12.2	12.2	7	Yes	10	12.2	1.220	Yes	No	0.022	No	No
7440-39-3	Barium	Metals	mg/kg	01-Jan-98	01-Jan-98	0	2	1	0	100%			81.3	81.3	81.3	NA	NA	500	81.3	0.163	No	No	0.003	No	No
7440-43-9	Cadmium	Metals	mg/kg	01-Jan-98	01-Oct-08	0	2	8	1	88%	0.5	0.5	0.189	1.11	1.11	1	Yes	4	1.11	0.278	No	No	0.005	No	No
1308-38-9	Chromium	Metals	mg/kg	01-Jan-98	01-Oct-08	0	2	8	0	100%			12.5	29	29	42	No	1	29	29.000	Yes	Yes	0.529	Yes	Yes
7440-50-8	Copper	Metals	mg/kg	26-Sep-06	01-Oct-08	0	0.5	7	0	100%			33.3	271	271	36	Yes	100	271	2.710	Yes	No	0.049	No	No
7439-92-1	Lead	Metals	mg/kg	01-Jan-98	01-Oct-08	0	2	20	0	100%			6.94	170	170	17	Yes	50	170	3.400	Yes	No	0.062	No	No
7439-97-6	Mercury	Metals	mg/kg	01-Jan-98	26-Jul-04	0	2	1	1	0%	0.1	0.1			0.1	0.07	Yes	0.3	<5%D	NA	No	No	NA	No	No
7440-02-0	Nickel	Metals	mg/kg	26-Sep-06	01-Oct-08	0	0.5	7	0	100%			15	26.8	26.8	38	No	30	26.8	0.893	No	No	0.016	No	No
7782-49-2	Selenium	Metals	mg/kg	01-Jan-98	26-Jul-04	0	2	1	1	0%	0.5	0.5			0.5	2	No	1	<5%D	NA	No	No	NA	No	No
7440-22-4	Silver	Metals	mg/kg	01-Jan-98	01-Oct-08	0	2	8	1	88%	0.5	0.5	0.036	0.19	0.5	1	No	2	0.5	0.250	No	No	0.005	No	No
7440-66-6	Zinc	Metals	mg/kg	26-Sep-06	01-Oct-08	0	0.5	7	0	100%			121	835	835	86	Yes	50	835	16.700	Yes	Yes	0.305	Yes	No
91-57-6	2-Methylnaphthalene	PAHs	mg/kg	26-Sep-06	01-Oct-08	0	0.5	16	2	88%	0.0026	0.0028	0.0021	0.023	0.023	NA	NA	NA	0.023	NA	No	No	NA	No	No
83-32-9	Acenaphthene	PAHs	mg/kg	26-Sep-06	01-Oct-08	0	0.5	16	6	63%	0.0026	0.0028	0.0007	0.017	0.017	NA	NA	20	0.017	0.001	No	No	0.000	No	No
208-96-8	Acenaphthylene	PAHs	mg/kg	26-Sep-06	01-Oct-08	0	0.5	16	0	100%			0.0018	0.084	0.084	NA	NA	20	0.084	0.004	No	No	0.000	No	No
120-12-7	Anthracene	PAHs	mg/kg	26-Sep-06	01-Oct-08	0	0.5	16	0	100%			0.0022	0.049	0.049	NA	NA	NA	0.049	NA	No	No	NA	No	No
56-55-3	Benz(a)anthracene	PAHs	mg/kg	26-Sep-06	01-Oct-08	0	0.5	16	0	100%			0.017	0.23	0.23	NA	NA	NA	0.23	NA	No	No	NA	No	No
50-32-8	Benzo(a)pyrene	PAHs	mg/kg	26-Sep-06	01-Oct-08	0	0.5	16	0	100%			0.029	0.52	0.52	NA	NA	NA	0.52	NA	No	No	NA	No	No
205-99-2	Benzo(b)fluoranthene	PAHs	mg/kg	26-Sep-06	01-Oct-08	0	0.5	16	0	100%			0.035	0.52	0.52	NA	NA	NA	0.52	NA	No	No	NA	No	No
191-24-2	Benzo(g,h,i)perylene	PAHs	mg/kg	26-Sep-06	01-Oct-08	0	0.5	16	0	100%			0.03	0.72	0.72	NA	NA	NA	0.72	NA	No	No	NA	No	No
207-08-9	Benzo(k)fluoranthene	PAHs	mg/kg	26-Sep-06	01-Oct-08	0	0.5	16	0	100%			0.12	0.38	0.38	NA	NA	NA	0.38	NA	No	No	NA	No	No
218-01-9	Chrysene	PAHs	mg/kg	26-Sep-06	01-Oct-08	0	0.5	16	0	100%			0.026	0.43	0.43	NA	NA	NA	0.43	NA	No	No	NA	No	No
53-70-3	Dibenz(a,h)anthracene	PAHs	mg/kg	26-Sep-06	01-Oct-08	0	0.5	16	0	100%			0.0057	0.077	0.077	NA	NA	NA	0.077	NA	No	No	NA	No	No
132-64-9	Dibenzofuran	PAHs	mg/kg	26-Sep-06	01-Oct-08	0	0.5	16	5	69%	0.0026	0.0028	0.001	0.01	0.01	NA	NA	NA	0.01	NA	No	No	NA	No	No
206-44-0	Fluoranthene	PAHs	mg/kg	26-Sep-06	01-Oct-08	0	0.5	16	0	100%			0.032	0.5	0.5	NA	NA	NA	0.5	NA	No	No	NA	No	No
86-73-7	Fluorene	PAHs	mg/kg	26-Sep-06	01-Oct-08	0	0.5	16	7	56%	0.0026	0.0028	0.0007	0.015	0.015	NA	NA	NA	0.015	NA	No	No	NA	No	No
193-39-5	Indeno(1,2,3-cd)pyrene	PAHs	mg/kg	26-Sep-06	01-Oct-08	0	0.5	16	0	100%			0.03	0.66	0.66	NA	NA	NA	0.66	NA	No	No	NA	No	No
91-20-3	Naphthalene	PAHs	mg/kg	26-Sep-06	01-Oct-08	0	0.5	16	0	100%			0.0035	0.023	0.023	NA	NA	10	0.023	0.002	No	No	0.000	No	No
85-01-8	Phenanthrene	PAHs	mg/kg	26-Sep-06	01-Oct-08	0	0.5	16	0	100%			0.015	0.19	0.19	NA	NA	NA	0.19	NA	No	No	NA	No	No
129-00-0	Pyrene	PAHs	mg/kg	26-Sep-06	01-Oct-08	0	0.5	16	0	100%			0.038	0.69	0.69	NA	NA	NA	0.69	NA	No	No	NA	No	No
12674-11-2	Aroclor 1016	PCBs	mg/kg	01-Jan-98	01-Oct-08	0	2	8	8	0%	0.01	0.055			0.055	NA	NA	NA	<5%D	NA	No	No	NA	No	No
11104-28-2	Aroclor 1221	PCBs	mg/kg	01-Jan-98	01-Oct-08	0	2	8	8	0%	0.02	0.11			0.11	NA	NA	NA	<5%D	NA	No	No	NA	No	No
11141-16-5	Aroclor 1232	PCBs	mg/kg	01-Jan-98	01-Oct-08	0	2	8	8	0%	0.01	0.055			0.055	NA	NA	NA	<5%D	NA	No	No	NA	No	No
53469-21-9	Aroclor 1242	PCBs	mg/kg	01-Jan-98	01-Oct-08	0	2	8	8	0%	0.01	0.055			0.055	NA	NA	NA	<5%D	NA	No	No	NA	No	No
12672-29-6	Aroclor 1248	PCBs	mg/kg	01-Jan-98	01-Oct-08	0	2	8	8	0%	0.01	0.055			0.055	NA	NA	NA	<5%D	NA	No	No	NA	No	No
11097-69-1	Aroclor 1254	PCBs	mg/kg	01-Jan-98	01-Oct-08	0	2	8	6	25%	0.01	0.055	0.014	0.023	0.055	NA	NA	NA	0.055	NA	No	No	NA	No	No
11096-82-5	Aroclor 1260	PCBs	mg/kg	01-Jan-98	01-Oct-08	0	2	8	2	75%	0.05	0.055	0.044	0.078	0.078	NA	NA	NA	0.078	NA	No	No	NA	No	No
37324-23-5	Aroclor 1262	PCBs	mg/kg	01-Oct-08	01-Oct-08	0	0.5	4	4	0%	0.01	0.01			0.01	NA	NA	NA	<5%D	NA	No	No	NA	No	No
11100-14-4	Aroclor 1268	PCBs	mg/kg	01-Oct-08	01-Oct-08	0	0.5	4	4	0%	0.01	0.01			0.01	NA	NA	NA	<5%D	NA	No	No	NA	No	No
1336-36-3	Total PCBs	PCBs	mg/kg	26-Sep-06	01-Oct-08	0	0.5	8	0	100%			0.055	0.103	0.103	NA	NA	40	0.103	0.003	No	No	0.000	No	No
117-81-7	Bis(2-ethylhexyl) Phthalate	Phthalates	mg/kg	01-Oct-08	01-Oct-08	0	0.5	3	0	100%			0.03	0.36	0.36	NA	NA	NA	0.36	NA	No	No	NA	No	No
85-68-7	Butyl Benzyl Phthalate	Phthalates	mg/kg	01-Oct-08	01-Oct-08	0	0.5	3	1	67%	0.1	0.1	0.0088	0.12	0.12	NA	NA	NA	0.12	NA	No	No	NA	No	No
84-66-2	Diethyl Phthalate	Phthalates	mg/kg	01-Oct-08	01-Oct-08	0	0.5	3	2	33%	0.1	0.1	0.0021	0.0021	0.1	NA	NA	100	0.1	0.001	No	No	0.000	No	No
131-11-3	Dimethyl Phthalate	Phthalates	mg/kg	01-Oct-08	01-Oct-08	0	0.5	3	3	0%	0.01	0.1			0.1	NA	NA	100	<5%D	NA	No	No	NA	No	No
84-74-2	Di-n-butyl Phthalate	Phthalates	mg/kg	01-Oct-08	01-Oct-08	0	0.5	3	3	0%	0.02	0.2			0.2	NA	NA	200	<5%D	NA	No	No	NA	No	No
117-84-0	Di-n-octyl Phthalate	Phthalates	mg/kg	01-Oct-08	01-Oct-08	0	0.5	3	3	0%	0.01	0.1			0.1	NA	NA	NA	<5%D	NA	No	No	NA	No	No
TnBT	Tri-n-butyltin	TBT	mg/kg	01-Oct-08	01-Oct-08	0	0.5	12	4	67%	0.0049	0.005	0.007	0.58	0.58	NA	NA	NA	0.58	NA	No	No	NA	No	No

APPENDIX C-1 Riverbank Soil Summary and Risk Screening

Swan Island OU2 Upland Facility - Oregon Screening Levels (Receptors - Plants)

Constituents of Interest (COI)				Date		Depth Range (ft)		Samples			Non-detected Concentrations		Detected Concentrations		Overall Max	Background Levels[1]	Max COI Conc. Exceeds Background ?	Oregon Screening Levels[2]	COI Conc. (max)	Risk Ratio for Individual COI	Max COI Conc. Exceeds SLV - Individual COI Risk? (Q=1) (T&E)	Max COI Conc. Exceeds SLV - Individual COI Risk? (Q=5)	Risk Ratio for Multiple COIs	Max COI Conc. Exceeds SLV - Multiple COI Risk? (Q=1) (T&E)	Max COI Conc. Exceeds SLV - Multiple COI Risk? (Q=5)
CASNo	Analyte	Analyte Group/Methods	Units	Min	Max	Min	Max	Number of Samples	Number of Non-detects	Detection Frequency	Min	Max	Min	Max		Natural Background Soil Concs (mg/kg)		Plant Receptors	Cij	Tij			Tij/Tj		
HORHC	Heavy Oil Range Hydrocarbons	TPH (418.1)	mg/kg	01-Jan-98	01-Jan-98	0	2	1	1	0%	100	100			100	NA	NA	NA	<5%D	NA	No	No	NA	No	No
68476-34-6	Diesel	TPH (HCID)	mg/kg	26-Sep-06	26-Sep-06	0	0.5	1	1	0%	50	50			50	NA	NA	NA	<5%D	NA	No	No	NA	No	No
8006-61-9	Gasoline	TPH (HCID)	mg/kg	26-Sep-06	26-Sep-06	0	0.5	3	3	0%	20	20			20	NA	NA	NA	<5%D	NA	No	No	NA	No	No
68476-34-6	Diesel	TPH (NWTPH-Dx)	mg/kg	26-Sep-06	01-Oct-08	0	0.5	7	0	100%			3.2	100	100	NA	NA	NA	100	NA	No	No	NA	No	No
RRO	Oil	TPH (NWTPH-Dx)	mg/kg	26-Sep-06	01-Oct-08	0	0.5	7	0	100%			27	820	820	NA	NA	NA	820	NA	No	No	NA	No	No
8006-61-9	Gasoline	TPH (NWTPH-Gx)	mg/kg	01-Oct-08	01-Oct-08	0	0.5	4	4	0%	5.5	6.2			6.2	NA	NA	NA	<5%D	NA	No	No	NA	No	No

Notes about data included in summary:

All available data for riverbank locations (both composite and corresponding discrete sub-samples) included in summary.

Riverbank locations: WR-164/RB-1 composite; WR-159/RB-2 composite; WR-160/RB-3 composite; WR-399/RB-4 composite; CG-26/RB-5 composite; CG-27/RB-6 composite; WR-159a/RB-7 composite; PS-S-01-01/Boring 1

Only data from samples collected within 3 ft included in summary.
TPH results from different analytical methods kept separate.

Tj = Sum of toxicity ratios for all COIs in medium j 54.810
Nij = Number of i COIs in medium j 15.000
1/Nij= 0.067

Acronyms:

DEQ - Oregon Department of Environmental Quality
EPA - U.S. Environmental Protection Agency
ND - non-detect
mg/kg - milligram per kilogram
min - minimum
max - maximum
NA - not available
<5%D - less than 5% detection frequency
COI - constituent of interest
SLV - screening level value
Cij -concentration of COI i in medium j
Tij - toxicity ratios for COI i in medium j
T&E - listed threatened and endangered species
Q = 1 for T&E species
Q = 5 for non-T&E species

Notes about analyte types/methods:

TPH-Gx = Gasoline-range Total Petroleum Hydrocarbons (TPH) by Northwest Method NWTPH-Gx
TPH-Dx = Diesel-range Total Petroleum Hydrocarbons (TPH) by Northwest Method NWTPH-Dx (with silica gel cleanup)
HCID = Total Petroleum Hydrocarbons (TPH) Identification by Northwest Method NWTPH-HCID
418.1 =Total Petroleum Hydrocarbons (TPH) by EPA Method 418.1
Metals analysis by U.S. Environmental Protection Agency (EPA) 6000/7000 Series Methods
Polynuclear Aromatic Hydrocarbons (PAHs) by U.S. Environmental Protection Agency (EPA) Method 8270 C SIM
Phthalates by U.S. Environmental Protection Agency (EPA) Method 8270C
Polychlorinated Biphenyl (PCB) Aroclors by U.S. Environmental Protection Agency (EPA) Method 8082
Tri-n-butyltin (TBT) by Krone Method

Notes about criteria:

1 - Oregon Department of Environmental Quality (DEQ). 2002. DEQ Toxicology Workgroup Memorandum to DEQ Cleanup Project Managers regarding "Default background concentrations for metals". October 28, 2002.

2 - All Level II Screening Level Values (SLV) from Oregon DEQ, Table 1, Guidance for Ecological Risk Assessment, December 2001

chromium III applied to chromium
mercury (elemental, total) applied to mercury
arsenic III applied to arsenic
acenapthene applied to acenapthylene

APPENDIX C-2 Riverbank Soil Summary and Risk Screening

Swan Island OU2 Upland Facility - Oregon Screening Levels (Receptors - Invertebrates)

Constituents of Interest (COI)				Date		Depth Range (ft)		Samples			Non-detected Concentrations		Detected Concentrations		Overall Max	Background Levels[1]	Max COI Conc. Exceeds Background?	Oregon Screening Levels[2]	COI Conc. (max)	Risk Ratio for Individual COI	Max COI Conc. Exceeds SLV - Individual COI Risk? (Q=1) (T&E)	Max COI Conc. Exceeds SLV - Individual COI Risk? (Q=5)	Risk Ratio for Multiple COIs	Max COI Conc. Exceeds SLV - Multiple COI Risk? (Q=1) (T&E)	Max COI Conc. Exceeds SLV - Multiple COI Risk? (Q=5)
CASNo	Analyte	Analyte Group/ Methods	Units	Min	Max	Min	Max	Number of Samples	Number of Non-detects	Detection Frequency	Min	Max	Min	Max		Natural Background Soil Concs (mg/kg)		Invertebrate Receptors	Cij	Tij			Tij/Tj		
7440-36-0	Antimony	Metals	mg/kg	26-Sep-06	01-Oct-08	0	0.5	7	0	100%			0.27	0.93	0.93	4	No	NA	0.93	NA	No	No	NA	No	No
7440-38-2	Arsenic	Metals	mg/kg	01-Jan-98	01-Oct-08	0	2	8	0	100%			2.7	12.2	12.2	7	Yes	60	12.2	0.203	No	No	0.002	No	No
7440-39-3	Barium	Metals	mg/kg	01-Jan-98	01-Jan-98	0	2	1	0	100%			81.3	81.3	81.3	NA	NA	3000	81.3	0.027	No	No	0.000	No	No
7440-43-9	Cadmium	Metals	mg/kg	01-Jan-98	01-Oct-08	0	2	8	1	88%	0.5	0.5	0.189	1.11	1.11	1	Yes	20	1.11	0.056	No	No	0.001	No	No
1308-38-9	Chromium	Metals	mg/kg	01-Jan-98	01-Oct-08	0	2	8	0	100%			12.5	29	29	42	No	0.4	29	72.500	Yes	Yes	0.875	Yes	Yes
7440-50-8	Copper	Metals	mg/kg	26-Sep-06	01-Oct-08	0	0.5	7	0	100%			33.3	271	271	36	Yes	50	271	5.420	Yes	Yes	0.065	No	No
7439-92-1	Lead	Metals	mg/kg	01-Jan-98	01-Oct-08	0	2	20	0	100%			6.94	170	170	17	Yes	500	170	0.340	No	No	0.004	No	No
7439-97-6	Mercury	Metals	mg/kg	01-Jan-98	26-Jul-04	0	2	1	1	0%	0.1	0.1			0.1	0.07	Yes	0.1	<5%D	NA	No	No	NA	No	No
7440-02-0	Nickel	Metals	mg/kg	26-Sep-06	01-Oct-08	0	0.5	7	0	100%			15	26.8	26.8	38	No	200	26.8	0.134	No	No	0.002	No	No
7782-49-2	Selenium	Metals	mg/kg	01-Jan-98	26-Jul-04	0	2	1	1	0%	0.5	0.5			0.5	2	No	70	<5%D	NA	No	No	NA	No	No
7440-22-4	Silver	Metals	mg/kg	01-Jan-98	01-Oct-08	0	2	8	1	88%	0.5	0.5	0.036	0.19	0.5	1	No	50	0.5	0.010	No	No	0.000	No	No
7440-66-6	Zinc	Metals	mg/kg	26-Sep-06	01-Oct-08	0	0.5	7	0	100%			121	835	835	86	Yes	200	835	4.175	Yes	No	0.050	No	No
91-57-6	2-Methylnaphthalene	PAHs	mg/kg	26-Sep-06	01-Oct-08	0	0.5	16	2	88%	0.0026	0.0028	0.0021	0.023	0.023	NA	NA	NA	0.023	NA	No	No	NA	No	No
83-32-9	Acenaphthene	PAHs	mg/kg	26-Sep-06	01-Oct-08	0	0.5	16	6	63%	0.0026	0.0028	0.0007	0.017	0.017	NA	NA	NA	0.017	NA	No	No	NA	No	No
208-96-8	Acenaphthylene	PAHs	mg/kg	26-Sep-06	01-Oct-08	0	0.5	16	0	100%			0.0018	0.084	0.084	NA	NA	NA	0.084	NA	No	No	NA	No	No
120-12-7	Anthracene	PAHs	mg/kg	26-Sep-06	01-Oct-08	0	0.5	16	0	100%			0.0022	0.049	0.049	NA	NA	NA	0.049	NA	No	No	NA	No	No
56-55-3	Benz(a)anthracene	PAHs	mg/kg	26-Sep-06	01-Oct-08	0	0.5	16	0	100%			0.017	0.23	0.23	NA	NA	NA	0.23	NA	No	No	NA	No	No
50-32-8	Benzo(a)pyrene	PAHs	mg/kg	26-Sep-06	01-Oct-08	0	0.5	16	0	100%			0.029	0.52	0.52	NA	NA	NA	0.52	NA	No	No	NA	No	No
205-99-2	Benzo(b)fluoranthene	PAHs	mg/kg	26-Sep-06	01-Oct-08	0	0.5	16	0	100%			0.035	0.52	0.52	NA	NA	NA	0.52	NA	No	No	NA	No	No
191-24-2	Benzo(g,h,i)perylene	PAHs	mg/kg	26-Sep-06	01-Oct-08	0	0.5	16	0	100%			0.03	0.72	0.72	NA	NA	NA	0.72	NA	No	No	NA	No	No
207-08-9	Benzo(k)fluoranthene	PAHs	mg/kg	26-Sep-06	01-Oct-08	0	0.5	16	0	100%			0.12	0.38	0.38	NA	NA	NA	0.38	NA	No	No	NA	No	No
218-01-9	Chrysene	PAHs	mg/kg	26-Sep-06	01-Oct-08	0	0.5	16	0	100%			0.026	0.43	0.43	NA	NA	NA	0.43	NA	No	No	NA	No	No
53-70-3	Dibenz(a,h)anthracene	PAHs	mg/kg	26-Sep-06	01-Oct-08	0	0.5	16	0	100%			0.0057	0.077	0.077	NA	NA	NA	0.077	NA	No	No	NA	No	No
132-64-9	Dibenzofuran	PAHs	mg/kg	26-Sep-06	01-Oct-08	0	0.5	16	5	69%	0.0026	0.0028	0.001	0.01	0.01	NA	NA	NA	0.01	NA	No	No	NA	No	No
206-44-0	Fluoranthene	PAHs	mg/kg	26-Sep-06	01-Oct-08	0	0.5	16	0	100%			0.032	0.5	0.5	NA	NA	NA	0.5	NA	No	No	NA	No	No
86-73-7	Fluorene	PAHs	mg/kg	26-Sep-06	01-Oct-08	0	0.5	16	7	56%	0.0026	0.0028	0.0007	0.015	0.015	NA	NA	30	0.015	0.001	No	No	0.000	No	No
193-39-5	Indeno(1,2,3-cd)pyrene	PAHs	mg/kg	26-Sep-06	01-Oct-08	0	0.5	16	0	100%			0.03	0.66	0.66	NA	NA	NA	0.66	NA	No	No	NA	No	No
91-20-3	Naphthalene	PAHs	mg/kg	26-Sep-06	01-Oct-08	0	0.5	16	0	100%			0.0035	0.023	0.023	NA	NA	NA	0.023	NA	No	No	NA	No	No
85-01-8	Phenanthrene	PAHs	mg/kg	26-Sep-06	01-Oct-08	0	0.5	16	0	100%			0.015	0.19	0.19	NA	NA	NA	0.19	NA	No	No	NA	No	No
129-00-0	Pyrene	PAHs	mg/kg	26-Sep-06	01-Oct-08	0	0.5	16	0	100%			0.038	0.69	0.69	NA	NA	NA	0.69	NA	No	No	NA	No	No
12674-11-2	Aroclor 1016	PCBs	mg/kg	01-Jan-98	01-Oct-08	0	2	8	8	0%	0.01	0.055			0.055	NA	NA	NA	<5%D	NA	No	No	NA	No	No
11104-28-2	Aroclor 1221	PCBs	mg/kg	01-Jan-98	01-Oct-08	0	2	8	8	0%	0.02	0.11			0.11	NA	NA	NA	<5%D	NA	No	No	NA	No	No
11141-16-5	Aroclor 1232	PCBs	mg/kg	01-Jan-98	01-Oct-08	0	2	8	8	0%	0.01	0.055			0.055	NA	NA	NA	<5%D	NA	No	No	NA	No	No
53469-21-9	Aroclor 1242	PCBs	mg/kg	01-Jan-98	01-Oct-08	0	2	8	8	0%	0.01	0.055			0.055	NA	NA	NA	<5%D	NA	No	No	NA	No	No
12672-29-6	Aroclor 1248	PCBs	mg/kg	01-Jan-98	01-Oct-08	0	2	8	8	0%	0.01	0.055			0.055	NA	NA	NA	<5%D	NA	No	No	NA	No	No
11097-69-1	Aroclor 1254	PCBs	mg/kg	01-Jan-98	01-Oct-08	0	2	8	6	25%	0.01	0.055	0.014	0.023	0.055	NA	NA	NA	0.055	NA	No	No	NA	No	No
11096-82-5	Aroclor 1260	PCBs	mg/kg	01-Jan-98	01-Oct-08	0	2	8	2	75%	0.05	0.055	0.044	0.078	0.078	NA	NA	NA	0.078	NA	No	No	NA	No	No
37324-23-5	Aroclor 1262	PCBs	mg/kg	01-Oct-08	01-Oct-08	0	0.5	4	4	0%	0.01	0.01			0.01	NA	NA	NA	<5%D	NA	No	No	NA	No	No
11100-14-4	Aroclor 1268	PCBs	mg/kg	01-Oct-08	01-Oct-08	0	0.5	4	4	0%	0.01	0.01			0.01	NA	NA	NA	<5%D	NA	No	No	NA	No	No
1336-36-3	Total PCBs	PCBs	mg/kg	26-Sep-06	01-Oct-08	0	0.5	8	0	100%			0.055	0.103	0.103	NA	NA	NA	0.103	NA	No	No	NA	No	No
117-81-7	Bis(2-ethylhexyl) Phthalate	Phthalates	mg/kg	01-Oct-08	01-Oct-08	0	0.5	3	0	100%			0.03	0.36	0.36	NA	NA	NA	0.36	NA	No	No	NA	No	No
85-68-7	Butyl Benzyl Phthalate	Phthalates	mg/kg	01-Oct-08	01-Oct-08	0	0.5	3	1	67%	0.1	0.1	0.0088	0.12	0.12	NA	NA	NA	0.12	NA	No	No	NA	No	No
84-66-2	Diethyl Phthalate	Phthalates	mg/kg	01-Oct-08	01-Oct-08	0	0.5	3	2	33%	0.1	0.1	0.0021	0.0021	0.1	NA	NA	200	0.1	0.001	No	No	0.000	No	No
131-11-3	Dimethyl Phthalate	Phthalates	mg/kg	01-Oct-08	01-Oct-08	0	0.5	3	3	0%	0.01	0.1			0.1	NA	NA	200	<5%D	NA	No	No	NA	No	No
84-74-2	Di-n-butyl Phthalate	Phthalates	mg/kg	01-Oct-08	01-Oct-08	0	0.5	3	3	0%	0.02	0.2			0.2	NA	NA	NA	<5%D	NA	No	No	NA	No	No
117-84-0	Di-n-octyl Phthalate	Phthalates	mg/kg	01-Oct-08	01-Oct-08	0	0.5	3	3	0%	0.01	0.1			0.1	NA	NA	NA	<5%D	NA	No	No	NA	No	No
TnBT	Tri-n-butyltin	TBT	mg/kg	01-Oct-08	01-Oct-08	0	0.5	12	4	67%	0.0049	0.005	0.007	0.58	0.58	NA	NA	NA	0.58	NA	No	No	NA	No	No

APPENDIX C-2 Riverbank Soil Summary and Risk Screening

Swan Island OU2 Upland Facility - Oregon Screening Levels (Receptors - Invertebrates)

Constituents of Interest (COI)				Date		Depth Range (ft)		Samples			Non-detected Concentrations		Detected Concentrations		Overall Max	Background Levels[1]	Max COI Conc. Exceeds Background?	Oregon Screening Levels[2]	COI Conc. (max)	Risk Ratio for Individual COI	Max COI Conc. Exceeds SLV - Individual COI Risk? (Q=1) (T&E)	Max COI Conc. Exceeds SLV - Individual COI Risk? (Q=5)	Risk Ratio for Multiple COIs	Max COI Conc. Exceeds SLV - Multiple COI Risk? (Q=1) (T&E)	Max COI Conc. Exceeds SLV - Multiple COI Risk? (Q=5)
CASNo	Analyte	Analyte Group/ Methods	Units	Min	Max	Min	Max	Number of Samples	Number of Non-detects	Detection Frequency	Min	Max	Min	Max		Natural Background Soil Concs (mg/kg)		Invertebrate Receptors	Cij	Tij			Tij/Tj		
HORHC	Heavy Oil Range Hydrocarbons	TPH (418.1)	mg/kg	01-Jan-98	01-Jan-98	0	2	1	1	0%	100	100			100	NA	NA	NA	<5%D	NA	No	No	NA	No	No
68476-34-6	Diesel	TPH (HCID)	mg/kg	26-Sep-06	26-Sep-06	0	0.5	1	1	0%	50	50			50	NA	NA	NA	<5%D	NA	No	No	NA	No	No
8006-61-9	Gasoline	TPH (HCID)	mg/kg	26-Sep-06	26-Sep-06	0	0.5	3	3	0%	20	20			20	NA	NA	NA	<5%D	NA	No	No	NA	No	No
68476-34-6	Diesel	TPH (NWTPH-Dx)	mg/kg	26-Sep-06	01-Oct-08	0	0.5	7	0	100%			3.2	100	100	NA	NA	NA	100	NA	No	No	NA	No	No
RRO	Oil	TPH (NWTPH-Dx)	mg/kg	26-Sep-06	01-Oct-08	0	0.5	7	0	100%			27	820	820	NA	NA	NA	820	NA	No	No	NA	No	No
8006-61-9	Gasoline	TPH (NWTPH-Gx)	mg/kg	01-Oct-08	01-Oct-08	0	0.5	4	4	0%	5.5	6.2			6.2	NA	NA	NA	<5%D	NA	No	No	NA	No	No

Notes about data included in summary:
All available data for riverbank locations (both composite and corresponding discrete sub-samples) included in summary.
Riverbank locations: WR-164/RB-1 composite; WR-159/RB-2 composite; WR-160/RB-3 composite; WR-399/RB-4 composite; CG-26/RB-5 composite; CG-27/RB-6 composite; WR-159a/RB-7 composite; PS-S-01-01/Boring 1
Only data from samples collected within 3 ft included in summary.
TPH results from different analytical methods kept separate.

Tj = Sum of toxicity ratios for all COIs in medium j 82.866
Nij = Number of i COIs in medium j 11.000
1/Nij= 0.091

Acronyms:
DEQ - Oregon Department of Environmental Quality
EPA - U.S. Environmental Protection Agency
ND - non-detect
mg/kg - milligram per kilogram
min - minimum
max - maximum
NA - not available
<5%D - less than 5% detection frequency
COI - constituent of interest
SLV - screening level value
Cij -concentration of COI i in medium j
Tij - toxicity ratios for COI i in medium j
T&E - listed threatened and endangered species
Q = 1 for T&E species
Q = 5 for non-T&E species

Notes about analyte types/methods:
TPH-Gx = Gasoline-range Total Petroleum Hydrocarbons (TPH) by Northwest Method NWTPH-Gx
TPH-Dx = Diesel-range Total Petroleum Hydrocarbons (TPH) by Northwest Method NWTPH-Dx (with silica gel cleanup)
HCID = Total Petroleum Hydrocarbons (TPH) Identification by Northwest Method NWTPH-HCID
418.1 =Total Petroleum Hydrocarbons (TPH) by EPA Method 418.1
Metals analysis by U.S. Environmental Protection Agency (EPA) 6000/7000 Series Methods
Polynuclear Aromatic Hydrocarbons (PAHs) by U.S. Environmental Protection Agency (EPA) Method 8270 C SIM
Phthalates by U.S. Environmental Protection Agency (EPA) Method 8270C
Polychlorinated Biphenyl (PCB) Aroclors by U.S. Environmental Protection Agency (EPA) Method 8082
Tri-n-butyltin by Krone Method

Notes about criteria:
1 - Oregon Department of Environmental Quality (DEQ). 2002. DEQ Toxicology Workgroup Memorandum to DEQ Cleanup Project Managers regarding "Default background concentrations for metals". October 28, 2002.
2 - All Level II Screening Level Values (SLV) from Oregon DEQ, Table 1, Guidance for Ecological Risk Assessment, December 2001
chromium III applied to chromium
arsenic III applied to arsenic
mercury (elemental, total) applied to mercury
diethyl pthalate applied to dimethyl pthalate

APPENDIX C-3 Riverbank Soil Summary and Risk Screening

Swan Island OU2 Upland Facility - Oregon Screening Levels (Receptors - Birds)

Constituents of Interest (COI)				Date		Depth Range (ft)		Samples			Non-detected Concentrations		Detected Concentrations		Overall Max	Background Levels[1]	Max COI Conc. Exceeds Background?	Oregon Screening Levels[2]	COI Conc. (max)	Risk Ratio for Individual COI	Max COI Conc. Exceeds SLV - Individual COI Risk? (Q=1) (T&E)	Max COI Conc. Exceeds SLV - Individual COI Risk? (Q=5)	Risk Ratio for Multiple COIs	Max COI Conc. Exceeds SLV - Multiple COI Risk? (Q=1) (T&E)	Max COI Conc. Exceeds SLV - Multiple COI Risk? (Q=5)
CASNo	Analyte	Analyte Group/ Methods	Units	Min	Max	Min	Max	Number of Samples	Number of Non-detects	Detection Frequency	Min	Max	Min	Max		Natural Background Soil Concs (mg/kg)		Bird Receptors	Cij	Tij			Tij/Tj		
7440-36-0	Antimony	Metals	mg/kg	26-Sep-06	01-Oct-08	0	0.5	7	0	100%			0.27	0.93	0.93	4	No	NA	0.93	NA	No	No	NA	No	No
7440-38-2	Arsenic	Metals	mg/kg	01-Jan-98	01-Oct-08	0	2	8	0	100%			2.7	12.2	12.2	7	Yes	10	12.2	1.2	Yes	No	0.034	No	No
7440-39-3	Barium	Metals	mg/kg	01-Jan-98	01-Jan-98	0	2	1	0	100%			81.3	81.3	81.3	NA	NA	85	81.3	0.96	No	No	0.027	No	No
7440-43-9	Cadmium	Metals	mg/kg	01-Jan-98	01-Oct-08	0	2	8	1	88%	0.5	0.5	0.189	1.11	1.11	1	Yes	6	1.11	0.2	No	No	0.005	No	No
1308-38-9	Chromium	Metals	mg/kg	01-Jan-98	01-Oct-08	0	2	8	0	100%			12.5	29	29	42	No	4	29	7.3	Yes	Yes	0.202	Yes	No
7440-50-8	Copper	Metals	mg/kg	26-Sep-06	01-Oct-08	0	0.5	7	0	100%			33.3	271	271	36	Yes	190	271	1.4	Yes	No	0.040	No	No
7439-92-1	Lead	Metals	mg/kg	01-Jan-98	01-Oct-08	0	2	20	0	100%			6.94	170	170	17	Yes	16	170	10.6	Yes	Yes	0.296	Yes	No
7439-97-6	Mercury	Metals	mg/kg	01-Jan-98	26-Jul-04	0	2	1	1	0%	0.1	0.1			0.1	0.07	Yes	1.5	<5%D	NA	No	No	NA	No	No
7440-02-0	Nickel	Metals	mg/kg	26-Sep-06	01-Oct-08	0	0.5	7	0	100%			15	26.8	26.8	38	No	320	26.8	0.08	No	No	0.002	No	No
7782-49-2	Selenium	Metals	mg/kg	01-Jan-98	26-Jul-04	0	2	1	1	0%	0.5	0.5			0.5	2	No	2	<5%D	NA	No	No	NA	No	No
7440-22-4	Silver	Metals	mg/kg	01-Jan-98	01-Oct-08	0	2	8	1	88%	0.5	0.5	0.036	0.19	0.5	1	No	NA	0.5	NA	No	No	NA	No	No
7440-66-6	Zinc	Metals	mg/kg	26-Sep-06	01-Oct-08	0	0.5	7	0	100%			121	835	835	86	Yes	60	835	13.9	Yes	Yes	0.387	Yes	No
91-57-6	2-Methylnaphthalene	PAHs	mg/kg	26-Sep-06	01-Oct-08	0	0.5	16	2	88%	0.0026	0.0028	0.0021	0.023	0.023	NA	NA	NA	0.023	NA	No	No	NA	No	No
83-32-9	Acenaphthene	PAHs	mg/kg	26-Sep-06	01-Oct-08	0	0.5	16	6	63%	0.0026	0.0028	0.0007	0.017	0.017	NA	NA	NA	0.017	NA	No	No	NA	No	No
208-96-8	Acenaphthylene	PAHs	mg/kg	26-Sep-06	01-Oct-08	0	0.5	16	0	100%			0.0018	0.084	0.084	NA	NA	NA	0.084	NA	No	No	NA	No	No
120-12-7	Anthracene	PAHs	mg/kg	26-Sep-06	01-Oct-08	0	0.5	16	0	100%			0.0022	0.049	0.049	NA	NA	NA	0.049	NA	No	No	NA	No	No
56-55-3	Benz(a)anthracene	PAHs	mg/kg	26-Sep-06	01-Oct-08	0	0.5	16	0	100%			0.017	0.23	0.23	NA	NA	NA	0.23	NA	No	No	NA	No	No
50-32-8	Benzo(a)pyrene	PAHs	mg/kg	26-Sep-06	01-Oct-08	0	0.5	16	0	100%			0.029	0.52	0.52	NA	NA	NA	0.52	NA	No	No	NA	No	No
205-99-2	Benzo(b)fluoranthene	PAHs	mg/kg	26-Sep-06	01-Oct-08	0	0.5	16	0	100%			0.035	0.52	0.52	NA	NA	NA	0.52	NA	No	No	NA	No	No
191-24-2	Benzo(g,h,i)perylene	PAHs	mg/kg	26-Sep-06	01-Oct-08	0	0.5	16	0	100%			0.03	0.72	0.72	NA	NA	NA	0.72	NA	No	No	NA	No	No
207-08-9	Benzo(k)fluoranthene	PAHs	mg/kg	26-Sep-06	01-Oct-08	0	0.5	16	0	100%			0.12	0.38	0.38	NA	NA	NA	0.38	NA	No	No	NA	No	No
218-01-9	Chrysene	PAHs	mg/kg	26-Sep-06	01-Oct-08	0	0.5	16	0	100%			0.026	0.43	0.43	NA	NA	NA	0.43	NA	No	No	NA	No	No
53-70-3	Dibenz(a,h)anthracene	PAHs	mg/kg	26-Sep-06	01-Oct-08	0	0.5	16	0	100%			0.0057	0.077	0.077	NA	NA	NA	0.077	NA	No	No	NA	No	No
132-64-9	Dibenzofuran	PAHs	mg/kg	26-Sep-06	01-Oct-08	0	0.5	16	5	69%	0.0026	0.0028	0.001	0.01	0.01	NA	NA	NA	0.01	NA	No	No	NA	No	No
206-44-0	Fluoranthene	PAHs	mg/kg	26-Sep-06	01-Oct-08	0	0.5	16	0	100%			0.032	0.5	0.5	NA	NA	NA	0.5	NA	No	No	NA	No	No
86-73-7	Fluorene	PAHs	mg/kg	26-Sep-06	01-Oct-08	0	0.5	16	7	56%	0.0026	0.0028	0.0007	0.015	0.015	NA	NA	NA	0.015	NA	No	No	NA	No	No
193-39-5	Indeno(1,2,3-cd)pyrene	PAHs	mg/kg	26-Sep-06	01-Oct-08	0	0.5	16	0	100%			0.03	0.66	0.66	NA	NA	NA	0.66	NA	No	No	NA	No	No
91-20-3	Naphthalene	PAHs	mg/kg	26-Sep-06	01-Oct-08	0	0.5	16	0	100%			0.0035	0.023	0.023	NA	NA	NA	0.023	NA	No	No	NA	No	No
85-01-8	Phenanthrene	PAHs	mg/kg	26-Sep-06	01-Oct-08	0	0.5	16	0	100%			0.015	0.19	0.19	NA	NA	NA	0.19	NA	No	No	NA	No	No
129-00-0	Pyrene	PAHs	mg/kg	26-Sep-06	01-Oct-08	0	0.5	16	0	100%			0.038	0.69	0.69	NA	NA	NA	0.69	NA	No	No	NA	No	No
12674-11-2	Aroclor 1016	PCBs	mg/kg	01-Jan-98	01-Oct-08	0	2	8	8	0%	0.01	0.055			0.055	NA	NA	0.7	<5%D	NA	No	No	NA	No	No
11104-28-2	Aroclor 1221	PCBs	mg/kg	01-Jan-98	01-Oct-08	0	2	8	8	0%	0.02	0.11			0.11	NA	NA	0.7	<5%D	NA	No	No	NA	No	No
11141-16-5	Aroclor 1232	PCBs	mg/kg	01-Jan-98	01-Oct-08	0	2	8	8	0%	0.01	0.055			0.055	NA	NA	0.7	<5%D	NA	No	No	NA	No	No
53469-21-9	Aroclor 1242	PCBs	mg/kg	01-Jan-98	01-Oct-08	0	2	8	8	0%	0.01	0.055			0.055	NA	NA	1.5	<5%D	NA	No	No	NA	No	No
12672-29-6	Aroclor 1248	PCBs	mg/kg	01-Jan-98	01-Oct-08	0	2	8	8	0%	0.01	0.055			0.055	NA	NA	0.7	<5%D	NA	No	No	NA	No	No
11097-69-1	Aroclor 1254	PCBs	mg/kg	01-Jan-98	01-Oct-08	0	2	8	6	25%	0.01	0.055	0.014	0.023	0.055	NA	NA	0.7	0.055	0.08	No	No	0.002	No	No
11096-82-5	Aroclor 1260	PCBs	mg/kg	01-Jan-98	01-Oct-08	0	2	8	2	75%	0.05	0.055	0.044	0.078	0.078	NA	NA	0.7	0.078	0.1	No	No	0.003	No	No
37324-23-5	Aroclor 1262	PCBs	mg/kg	01-Oct-08	01-Oct-08	0	0.5	4	4	0%	0.01	0.01			0.01	NA	NA	0.7	<5%D	NA	No	No	NA	No	No
11100-14-4	Aroclor 1268	PCBs	mg/kg	01-Oct-08	01-Oct-08	0	0.5	4	4	0%	0.01	0.01			0.01	NA	NA	0.7	<5%D	NA	No	No	NA	No	No
1336-36-3	Total PCBs	PCBs	mg/kg	26-Sep-06	01-Oct-08	0	0.5	8	0	100%			0.055	0.103	0.103	NA	NA	NA	0.103	NA	No	No	NA	No	No
117-81-7	Bis(2-ethylhexyl) Phthalate	Phthalates	mg/kg	01-Oct-08	01-Oct-08	0	0.5	3	0	100%			0.03	0.36	0.36	NA	NA	4.5	0.36	0.08	No	No	0.002	No	No
85-68-7	Butyl Benzyl Phthalate	Phthalates	mg/kg	01-Oct-08	01-Oct-08	0	0.5	3	1	67%	0.1	0.1	0.0088	0.12	0.12	NA	NA	NA	0.12	NA	No	No	NA	No	No
84-66-2	Diethyl Phthalate	Phthalates	mg/kg	01-Oct-08	01-Oct-08	0	0.5	3	2	33%	0.1	0.1	0.0021	0.0021	0.1	NA	NA	NA	0.1	NA	No	No	NA	No	No
131-11-3	Dimethyl Phthalate	Phthalates	mg/kg	01-Oct-08	01-Oct-08	0	0.5	3	3	0%	0.01	0.1			0.1	NA	NA	NA	<5%D	NA	No	No	NA	No	No
84-74-2	Di-n-butyl Phthalate	Phthalates	mg/kg	01-Oct-08	01-Oct-08	0	0.5	3	3	0%	0.02	0.2			0.2	NA	NA	0.45	<5%D	NA	No	No	NA	No	No
117-84-0	Di-n-octyl Phthalate	Phthalates	mg/kg	01-Oct-08	01-Oct-08	0	0.5	3	3	0%	0.01	0.1			0.1	NA	NA	0.45	<5%D	NA	No	No	NA	No	No
TnBT	Tri-n-butyltin	TBT	mg/kg	01-Oct-08	01-Oct-08	0	0.5	12	4	67%	0.0049	0.005	0.007	0.58	0.58	NA	NA	28	0.58	0.02	No	No	0.001	No	No

APPENDIX C-3 Riverbank Soil Summary and Risk Screening

Swan Island OU2 Upland Facility - Oregon Screening Levels (Receptors - Birds)

Constituents of Interest (COI)				Date		Depth Range (ft)		Samples			Non-detected Concentrations		Detected Concentrations		Overall Max	Background Levels[1]	Max COI Conc. Exceeds Background?	Oregon Screening Levels[2]	COI Conc. (max)	Risk Ratio for Individual COI	Max COI Conc. Exceeds SLV - Individual COI Risk? (Q=1) (T&E)	Max COI Conc. Exceeds SLV - Individual COI Risk? (Q=5)	Risk Ratio for Multiple COIs	Max COI Conc. Exceeds SLV - Multiple COI Risk? (Q=1) (T&E)	Max COI Conc. Exceeds SLV - Multiple COI Risk? (Q=5)
CASNo	Analyte	Analyte Group/ Methods	Units	Min	Max	Min	Max	Number of Samples	Number of Non-detects	Detection Frequency	Min	Max	Min	Max		Natural Background Soil Concs (mg/kg)		Bird Receptors	Cij	Tij			Tij/Tj		
HORHC	Heavy Oil Range Hydrocarbons	TPH (418.1)	mg/kg	01-Jan-98	01-Jan-98	0	2	1	1	0%	100	100			100	NA	NA	NA	<5%D	NA	No	No	NA	No	No
68476-34-6	Diesel	TPH (HCID)	mg/kg	26-Sep-06	26-Sep-06	0	0.5	1	1	0%	50	50			50	NA	NA	NA	<5%D	NA	No	No	NA	No	No
8006-61-9	Gasoline	TPH (HCID)	mg/kg	26-Sep-06	26-Sep-06	0	0.5	3	3	0%	20	20			20	NA	NA	NA	<5%D	NA	No	No	NA	No	No
68476-34-6	Diesel	TPH (NWTPH-Dx)	mg/kg	26-Sep-06	01-Oct-08	0	0.5	7	0	100%			3.2	100	100	NA	NA	NA	100	NA	No	No	NA	No	No
RRO	Oil	TPH (NWTPH-Dx)	mg/kg	26-Sep-06	01-Oct-08	0	0.5	7	0	100%			27	820	820	NA	NA	NA	820	NA	No	No	NA	No	No
8006-61-9	Gasoline	TPH (NWTPH-Gx)	mg/kg	01-Oct-08	01-Oct-08	0	0.5	4	4	0%	5.5	6.2			6.2	NA	NA	NA	<5%D	NA	No	No	NA	No	No

Notes about data included in summary:

All available data for riverbank locations (both composite and corresponding discrete sub-samples) included in summary.

Riverbank locations: WR-164/RB-1 composite; WR-159/RB-2 composite; WR-160/RB-3 composite; WR-399/RB-4 composite; CG-26/RB-5 composite; CG-27/RB-6 composite; WR-159a/RB-7 composite; PS-S-01-01/Boring 1

Only data from samples collected within 3 ft included in summary.
TPH results from different analytical methods kept separate.

Tj = Sum of toxicity ratios for all COIs in medium j 35.954
Nij = Number of i COIs in medium j 12.000
1/Nij= 0.083

Acronyms:

DEQ - Oregon Department of Environmental Quality
EPA - U.S. Environmental Protection Agency
ND - non-detect
mg/kg - milligram per kilogram
min - minimum
max - maximum
NA - not available
<5%D - less than 5% detection frequency

COI - constituent of interest
SLV - screening level value
Cij -concentration of COI i in medium j
Tij - toxicity ratios for COI i in medium j
T&E - listed threatened and endangered species
Q = 1 for T&E species
Q = 5 for non-T&E species

Notes about analyte types/methods:

TPH-Gx = Gasoline-range Total Petroleum Hydrocarbons (TPH) by Northwest Method NWTPH-Gx
TPH-Dx = Diesel-range Total Petroleum Hydrocarbons (TPH) by Northwest Method NWTPH-Dx (with silica gel cleanup)
HCID = Total Petroleum Hydrocarbons (TPH) Identification by Northwest Method NWTPH-HCID
418.1 =Total Petroleum Hydrocarbons (TPH) by EPA Method 418.1
Metals analysis by U.S. Environmental Protection Agency (EPA) 6000/7000 Series Methods
Polynuclear Aromatic Hydrocarbons (PAHs) by U.S. Environmental Protection Agency (EPA) Method 8270 C SIM
Phthalates by U.S. Environmental Protection Agency (EPA) Method 8270C
Polychlorinated Biphenyl (PCB) Aroclors by U.S. Environmental Protection Agency (EPA) Method 8082
Tri-n-butyltin by Krone Method

Notes about criteria:

1 - Oregon Department of Environmental Quality (DEQ). 2002. DEQ Toxicology Workgroup Memorandum to DEQ Cleanup Project Managers regarding "Default background concentrations for metals". October 28, 2002.

2 - All Level II Screening Level Values (SLV) from Oregon DEQ, Table 1, Guidance for Ecological Risk Assessment, December 2001

chromium III applied to chromium
mercury (elemental, total) applied to mercury
arsenic III applied to arsenic
di-n-butyl phthalate applied to di-n-octyl phthalate
tributyltin oxide applied to tri-n-butyltin
Aroclor 1254 applied to Aroclors without criteria

APPENDIX C-4 Riverbank Soil Summary and Risk Screening

Swan Island OU2 Upland Facility - Oregon Screening Levels (Receptors - Mammals)

Constituents of Interest (COI)				Date		Depth Range (ft)		Samples			Non-detected Concentrations		Detected Concentrations		Overall Max	Background Levels[1]	Max COI Conc. Exceeds Background?	Oregon Screening Levels[2]	COI Conc. (max)	Risk Ratio for Individual COI	Max COI Conc. Exceeds SLV - Individual COI Risk? (Q=1) (T&E)	Max COI Conc. Exceeds SLV - Individual COI Risk? (Q=5)	Risk Ratio for Multiple COIs	Max COI Conc. Exceeds SLV - Multiple COI Risk? (Q=1) (T&E)	Max COI Conc. Exceeds SLV - Multiple COI Risk? (Q=5)
CASNo	Analyte	Analyte Group/ Methods	Units	Min	Max	Min	Max	Number of Samples	Number of Non-detects	Detection Frequency	Min	Max	Min	Max		Natural Background Soil Concs (mg/kg)		Mammal Receptors	Cij	Tij			Tij/Tj		
7440-36-0	Antimony	Metals	mg/kg	26-Sep-06	01-Oct-08	0	0.5	7	0	100%			0.27	0.93	0.93	4	No	15	0.93	0.1	No	No	0.009	No	No
7440-38-2	Arsenic	Metals	mg/kg	01-Jan-98	01-Oct-08	0	2	8	0	100%			2.7	12.2	12.2	7	Yes	29	12.2	0.4	No	No	0.064	Yes	No
7440-39-3	Barium	Metals	mg/kg	01-Jan-98	01-Jan-98	0	2	1	0	100%			81.3	81.3	81.3	NA	NA	638	81.3	0.13	No	No	0.019	No	No
7440-43-9	Cadmium	Metals	mg/kg	01-Jan-98	01-Oct-08	0	2	8	1	88%	0.5	0.5	0.189	1.11	1.11	1	Yes	125	1.11	0.0	No	No	0.001	No	No
1308-38-9	Chromium	Metals	mg/kg	01-Jan-98	01-Oct-08	0	2	8	0	100%			12.5	29	29	42	No	410	29	0.1	No	No	0.011	No	No
7440-50-8	Copper	Metals	mg/kg	26-Sep-06	01-Oct-08	0	0.5	7	0	100%			33.3	271	271	36	Yes	390	271	0.7	No	No	0.105	Yes	No
7439-92-1	Lead	Metals	mg/kg	01-Jan-98	01-Oct-08	0	2	20	0	100%			6.94	170	170	17	Yes	4000	170	0.0	No	No	0.006	No	No
7439-97-6	Mercury	Metals	mg/kg	01-Jan-98	26-Jul-04	0	2	1	1	0%	0.1	0.1			0.1	0.07	Yes	73	<5%D	NA	No	No	NA	No	No
7440-02-0	Nickel	Metals	mg/kg	26-Sep-06	01-Oct-08	0	0.5	7	0	100%			15	26.8	26.8	38	No	625	26.8	0.04	No	No	0.007	No	No
7782-49-2	Selenium	Metals	mg/kg	01-Jan-98	26-Jul-04	0	2	1	1	0%	0.5	0.5			0.5	2	No	25	<5%D	NA	No	No	NA	No	No
7440-22-4	Silver	Metals	mg/kg	01-Jan-98	01-Oct-08	0	2	8	1	88%	0.5	0.5	0.036	0.19	0.5	1	No	NA	0.5	NA	No	No	NA	No	No
7440-66-6	Zinc	Metals	mg/kg	26-Sep-06	01-Oct-08	0	0.5	7	0	100%			121	835	835	86	Yes	20000	835	0.0	No	No	0.006	No	No
91-57-6	2-Methylnaphthalene	PAHs	mg/kg	26-Sep-06	01-Oct-08	0	0.5	16	2	88%	0.0026	0.0028	0.0021	0.023	0.023	NA	NA	NA	0.023	NA	No	No	NA	No	No
83-32-9	Acenaphthene	PAHs	mg/kg	26-Sep-06	01-Oct-08	0	0.5	16	6	63%	0.0026	0.0028	0.0007	0.017	0.017	NA	NA	NA	0.017	NA	No	No	NA	No	No
208-96-8	Acenaphthylene	PAHs	mg/kg	26-Sep-06	01-Oct-08	0	0.5	16	0	100%			0.0018	0.084	0.084	NA	NA	NA	0.084	NA	No	No	NA	No	No
120-12-7	Anthracene	PAHs	mg/kg	26-Sep-06	01-Oct-08	0	0.5	16	0	100%			0.0022	0.049	0.049	NA	NA	NA	0.049	NA	No	No	NA	No	No
56-55-3	Benz(a)anthracene	PAHs	mg/kg	26-Sep-06	01-Oct-08	0	0.5	16	0	100%			0.017	0.23	0.23	NA	NA	125	0.23	0.0	No	No	0.000	No	No
50-32-8	Benzo(a)pyrene	PAHs	mg/kg	26-Sep-06	01-Oct-08	0	0.5	16	0	100%			0.029	0.52	0.52	NA	NA	125	0.52	0.0	No	No	0.001	No	No
205-99-2	Benzo(b)fluoranthene	PAHs	mg/kg	26-Sep-06	01-Oct-08	0	0.5	16	0	100%			0.035	0.52	0.52	NA	NA	125	0.52	0.0	No	No	0.001	No	No
191-24-2	Benzo(g,h,i)perylene	PAHs	mg/kg	26-Sep-06	01-Oct-08	0	0.5	16	0	100%			0.03	0.72	0.72	NA	NA	125	0.72	0.0	No	No	0.001	No	No
207-08-9	Benzo(k)fluoranthene	PAHs	mg/kg	26-Sep-06	01-Oct-08	0	0.5	16	0	100%			0.12	0.38	0.38	NA	NA	125	0.38	0.0	No	No	0.000	No	No
218-01-9	Chrysene	PAHs	mg/kg	26-Sep-06	01-Oct-08	0	0.5	16	0	100%			0.026	0.43	0.43	NA	NA	NA	0.43	NA	No	No	NA	No	No
53-70-3	Dibenz(a,h)anthracene	PAHs	mg/kg	26-Sep-06	01-Oct-08	0	0.5	16	0	100%			0.0057	0.077	0.077	NA	NA	NA	0.077	NA	No	No	NA	No	No
132-64-9	Dibenzofuran	PAHs	mg/kg	26-Sep-06	01-Oct-08	0	0.5	16	5	69%	0.0026	0.0028	0.001	0.01	0.01	NA	NA	0.002	0.01	5.0	Yes	No	0.759	Yes	Yes
206-44-0	Fluoranthene	PAHs	mg/kg	26-Sep-06	01-Oct-08	0	0.5	16	0	100%			0.032	0.5	0.5	NA	NA	NA	0.5	NA	No	No	NA	No	No
86-73-7	Fluorene	PAHs	mg/kg	26-Sep-06	01-Oct-08	0	0.5	16	7	56%	0.0026	0.0028	0.0007	0.015	0.015	NA	NA	NA	0.015	NA	No	No	NA	No	No
193-39-5	Indeno(1,2,3-cd)pyrene	PAHs	mg/kg	26-Sep-06	01-Oct-08	0	0.5	16	0	100%			0.03	0.66	0.66	NA	NA	NA	0.66	NA	No	No	NA	No	No
91-20-3	Naphthalene	PAHs	mg/kg	26-Sep-06	01-Oct-08	0	0.5	16	0	100%			0.0035	0.023	0.023	NA	NA	3900	0.023	0.0	No	No	0.000	No	No
85-01-8	Phenanthrene	PAHs	mg/kg	26-Sep-06	01-Oct-08	0	0.5	16	0	100%			0.015	0.19	0.19	NA	NA	NA	0.19	NA	No	No	NA	No	No
129-00-0	Pyrene	PAHs	mg/kg	26-Sep-06	01-Oct-08	0	0.5	16	0	100%			0.038	0.69	0.69	NA	NA	NA	0.69	NA	No	No	NA	No	No
12674-11-2	Aroclor 1016	PCBs	mg/kg	01-Jan-98	01-Oct-08	0	2	8	8	0%	0.01	0.055			0.055	NA	NA	100	<5%D	NA	No	No	NA	No	No
11104-28-2	Aroclor 1221	PCBs	mg/kg	01-Jan-98	01-Oct-08	0	2	8	8	0%	0.02	0.11			0.11	NA	NA	4	<5%D	NA	No	No	NA	No	No
11141-16-5	Aroclor 1232	PCBs	mg/kg	01-Jan-98	01-Oct-08	0	2	8	8	0%	0.01	0.055			0.055	NA	NA	4	<5%D	NA	No	No	NA	No	No
53469-21-9	Aroclor 1242	PCBs	mg/kg	01-Jan-98	01-Oct-08	0	2	8	8	0%	0.01	0.055			0.055	NA	NA	5	<5%D	NA	No	No	NA	No	No
12672-29-6	Aroclor 1248	PCBs	mg/kg	01-Jan-98	01-Oct-08	0	2	8	8	0%	0.01	0.055			0.055	NA	NA	4	<5%D	NA	No	No	NA	No	No
11097-69-1	Aroclor 1254	PCBs	mg/kg	01-Jan-98	01-Oct-08	0	2	8	6	25%	0.01	0.055	0.014	0.023	0.055	NA	NA	4	0.055	0.01	No	No	0.002	No	No
11096-82-5	Aroclor 1260	PCBs	mg/kg	01-Jan-98	01-Oct-08	0	2	8	2	75%	0.05	0.055	0.044	0.078	0.078	NA	NA	4	0.078	0.0	No	No	0.003	No	No
37324-23-5	Aroclor 1262	PCBs	mg/kg	01-Oct-08	01-Oct-08	0	0.5	4	4	0%	0.01	0.01			0.01	NA	NA	4	<5%D	NA	No	No	NA	No	No
11100-14-4	Aroclor 1268	PCBs	mg/kg	01-Oct-08	01-Oct-08	0	0.5	4	4	0%	0.01	0.01			0.01	NA	NA	4	<5%D	NA	No	No	NA	No	No
1336-36-3	Total PCBs	PCBs	mg/kg	26-Sep-06	01-Oct-08	0	0.5	8	0	100%			0.055	0.103	0.103	NA	NA	4	0.103	0.0	No	No	0.004	No	No
117-81-7	Bis(2-ethylhexyl) Phthalate	Phthalates	mg/kg	01-Oct-08	01-Oct-08	0	0.5	3	0	100%			0.03	0.36	0.36	NA	NA	1020	0.36	0.00	No	No	0.000	No	No
85-68-7	Butyl Benzyl Phthalate	Phthalates	mg/kg	01-Oct-08	01-Oct-08	0	0.5	3	1	67%	0.1	0.1	0.0088	0.12	0.12	NA	NA	NA	0.12	NA	No	No	NA	No	No
84-66-2	Diethyl Phthalate	Phthalates	mg/kg	01-Oct-08	01-Oct-08	0	0.5	3	2	33%	0.1	0.1	0.0021	0.0021	0.1	NA	NA	250000	0.1	0.0	No	No	0.000	No	No
131-11-3	Dimethyl Phthalate	Phthalates	mg/kg	01-Oct-08	01-Oct-08	0	0.5	3	3	0%	0.01	0.1			0.1	NA	NA	250000	<5%D	NA	No	No	NA	No	No
84-74-2	Di-n-butyl Phthalate	Phthalates	mg/kg	01-Oct-08	01-Oct-08	0	0.5	3	3	0%	0.02	0.2			0.2	NA	NA	30000	<5%D	NA	No	No	NA	No	No
117-84-0	Di-n-octyl Phthalate	Phthalates	mg/kg	01-Oct-08	01-Oct-08	0	0.5	3	3	0%	0.01	0.1			0.1	NA	NA	30000	<5%D	NA	No	No	NA	No	No
TnBT	Tri-n-butyltin	TBT	mg/kg	01-Oct-08	01-Oct-08	0	0.5	12	4	67%	0.0049	0.005	0.007	0.58	0.58	NA	NA	1300	0.58	0.00	No	No	0.000	No	No

APPENDIX C-4 Riverbank Soil Summary and Risk Screening

Swan Island OU2 Upland Facility - Oregon Screening Levels (Receptors - Mammals)

Constituents of Interest (COI)				Date		Depth Range (ft)		Samples			Non-detected Concentrations		Detected Concentrations		Overall Max	Background Levels[1]	Max COI Conc. Exceeds Background?	Oregon Screening Levels[2]	COI Conc. (max)	Risk Ratio for Individual COI	Max COI Conc. Exceeds SLV - Individual COI Risk? (Q=1) (T&E)	Max COI Conc. Exceeds SLV - Individual COI Risk? (Q=5)	Risk Ratio for Multiple COIs	Max COI Conc. Exceeds SLV - Multiple COI Risk? (Q=1) (T&E)	Max COI Conc. Exceeds SLV - Multiple COI Risk? (Q=5)
CASNo	Analyte	Analyte Group/ Methods	Units	Min	Max	Min	Max	Number of Samples	Number of Non-detects	Detection Frequency	Min	Max	Min	Max		Natural Background Soil Concs (mg/kg)		Mammal Receptors	Cij	Tij			Tij/Tj		
HORHC	Heavy Oil Range Hydrocarbons	TPH (418.1)	mg/kg	01-Jan-98	01-Jan-98	0	2	1	1	0%	100	100			100	NA	NA	NA	<5%D	NA	No	No	NA	No	No
68476-34-6	Diesel	TPH (HCID)	mg/kg	26-Sep-06	26-Sep-06	0	0.5	1	1	0%	50	50			50	NA	NA	NA	<5%D	NA	No	No	NA	No	No
8006-61-9	Gasoline	TPH (HCID)	mg/kg	26-Sep-06	26-Sep-06	0	0.5	3	3	0%	20	20			20	NA	NA	NA	<5%D	NA	No	No	NA	No	No
68476-34-6	Diesel	TPH (NWTPH-Dx)	mg/kg	26-Sep-06	01-Oct-08	0	0.5	7	0	100%			3.2	100	100	NA	NA	NA	100	NA	No	No	NA	No	No
RRO	Oil	TPH (NWTPH-Dx)	mg/kg	26-Sep-06	01-Oct-08	0	0.5	7	0	100%			27	820	820	NA	NA	NA	820	NA	No	No	NA	No	No
8006-61-9	Gasoline	TPH (NWTPH-Gx)	mg/kg	01-Oct-08	01-Oct-08	0	0.5	4	4	0%	5.5	6.2			6.2	NA	NA	NA	<5%D	NA	No	No	NA	No	No

Notes about data included in summary:

All available data for riverbank locations (both composite and corresponding discrete sub-samples) included in summary.

Riverbank locations: WR-164/RB-1 composite; WR-159/RB-2 composite; WR-160/RB-3 composite; WR-399/RB-4 composite; CG-26/RB-5 composite; CG-27/RB-6 composite; WR-159a/RB-7 composite; PS-S-01-01/Boring 1

Only data from samples collected within 3 ft included in summary.
TPH results from different analytical methods kept separate.

Tj = Sum of toxicity ratios for all COIs in medium j 6.590
Nij = Number of i COIs in medium j 22.000
1/Nij= 0.045

Acronyms:

DEQ - Oregon Department of Environmental Quality
EPA - U.S. Environmental Protection Agency
ND - non-detect
mg/kg - milligram per kilogram
min - minimum
max - maximum
NA - not available
<5%D - less than 5% detection frequency

COI - constituent of interest
SLV - screening level value
Cij -concentration of COI i in medium j
Tij - toxicity ratios for COI i in medium j
T&E - listed threatened and endangered species
Q = 1 for T&E species
Q = 5 for non-T&E species

Notes about analyte types/methods:

TPH-Gx = Gasoline-range Total Petroleum Hydrocarbons (TPH) by Northwest Method NWTPH-Gx
TPH-Dx = Diesel-range Total Petroleum Hydrocarbons (TPH) by Northwest Method NWTPH-Dx (with silica gel cleanup)
HCID = Total Petroleum Hydrocarbons (TPH) Identification by Northwest Method NWTPH-HCID
418.1 =Total Petroleum Hydrocarbons (TPH) by EPA Method 418.1
Metals analysis by U.S. Environmental Protection Agency (EPA) 6000/7000 Series Methods
Polynuclear Aromatic Hydrocarbons (PAHs) by U.S. Environmental Protection Agency (EPA) Method 8270 C SIM
Phthalates by U.S. Environmental Protection Agency (EPA) Method 8270C
Polychlorinated Biphenyl (PCB) Aroclors by U.S. Environmental Protection Agency (EPA) Method 8082
Tri-n-butyltin by Krone Method

Notes about criteria:

1 - Oregon Department of Environmental Quality (DEQ). 2002. DEQ Toxicology Workgroup Memorandum to DEQ Cleanup Project Managers regarding "Default background concentrations for metals". October 28, 2002.

2 - All Level II Screening Level Values (SLV) from Oregon DEQ, Table 1, Guidance for Ecological Risk Assessment, December 2001

chromium VI applied to chromium
mercury (elemental, total) applied to mercury
arsenic III applied to arsenic
Aroclor 1254 applied to Aroclors without criteria
di-n-butyl phthalate applied to di-n-octyl phthalate
tributyltin oxide applied to tri-n-butyltin
diethyl pthalate applied to dimethyl pthalate
benzo(a)pyrene applied to other 'benz-' PAHs

APPENDIX D
Riverbank Area Surface Soil Summary with 90UCLs and Risk Screening – Wildlife Receptors

APPENDIX D Riverbank Soil Summary with 90UCLs and Risk Screening - Wildlife Receptors

Swan Island OU2 Upland Facility - Oregon Screening Levels (Receptors - Birds)

Constituents of Interest (COI)			Depth Range (ft)		Detected Concentrations		Overall Max	Background Levels[1]	Oregon Screening Levels[2]	COI Concentration (90 UCL)				Risk Ratio for Individual COI	Max COI Conc. Exceeds SLV - Individual COI Risk? (Q=1) (T&E)	Max COI Conc. Exceeds SLV- Individual COI Risk? (Q=5)
			Min	Max	Min	Max		Natural Background Soil Concs (mg/kg)	Bird Receptors							
CASNo	Analyte	Units								n	Cij	Dist.	Estimation Method	Tij		
7440-38-2	Arsenic	mg/kg	0	2	2.7	12.2	12.2	7	10	7	7.53	Lognormal	90% H-UCL	0.8	No	No
7440-50-8	Copper	mg/kg	0	0.5	33.3	271	271	36	190	7	153.0	Gamma	90% Approximate Gamma UCL	0.8	No	No
7439-92-1	Lead	mg/kg	0	2	6.94	170	170	17	16	7	57.74	Normal	90% Student's-t UCL	3.6	Yes	No
7440-66-6	Zinc	mg/kg	0	0.5	121	835	835	86.0	60	7	480.1	Gamma	90% Approximate Gamma UCL	8.0	Yes	Yes

Swan Island OU2 Upland Facility - Oregon Screening Levels (Receptors - Mammals)

Constituents of Interest (COI)			Depth Range (ft)		Detected Concentrations		Overall Max	Background Levels[1]	Oregon Screening Levels[2]	COI Concentration (90 UCL)				Risk Ratio for Individual COI	Max COI Conc. Exceeds SLV - Individual COI Risk? (Q=1) (T&E)	Max COI Conc. Exceeds SLV- Individual COI Risk? (Q=5)
			Min	Max	Min	Max		Natural Background Soil Concs (mg/kg)	Mammal Receptors							
CASNo	Analyte	Units								n	Cij	Dist.	Estimation Method	Tij		
7440-38-2	Arsenic	mg/kg	0	2	2.7	12.2	12.2	7	29	7	7.53	Lognormal	90% H-UCL	0.3	No	No
7440-50-8	Copper	mg/kg	0	0.5	33.3	271	271	36	390	7	153.0	Gamma	90% Approximate Gamma UCL	0.4	No	No
132-64-9	Dibenzofuran	mg/kg	0	0.5	0.001	0.01	0.01	NA	0.002	7	0.0052	Normal	90% KM (t) UCL	2.6	Yes	No

Notes:
90UCL - 90th upper confidence limit
mg/kg - milligram per kilogram
min - minimum
max - maximum
COI - constituent of interest
SLV - screening level value
Cij -concentration of COI i in medium j
Tij - toxicity ratios for COI i in medium j
n - sample size

Notes about data included in 90UCL calculations:

Data for riverbank locations included in summary; discrete sample results excluded from 90UCL calculation; only composite sample results used in 90UCL calculation.

Riverbank composite sample locations: WR-164/RB-1 composite; WR-159/RB-2 composite; WR-160/RB-3 composite; WR-399/RB-4 composite; CG-26/RB-5 composite; CG-27/RB-6 composite; WR-159a/RB-7 composite

Only data from samples collected within 3 ft included in summary.

Data summary (minimums and maximums) based on all available samples (i.e., discrete and composite samples)

90UCLs were calculated using USEPA ProUCL software, version 4.00.04.

* All Level II SLV criteria from Oregon DEQ, Table 1, Guidance for Ecological Risk Assessment, December 2001.

1 - Oregon Department of Environmental Quality (DEQ). 2002. DEQ Toxicology Workgroup Memorandum to DEQ Cleanup Project Managers regarding "Default background concentrations for metals". October 28, 2002.

2 - All Level II SLV criteria from Oregon DEQ, Table 1, Guidance for Ecological Risk Assessment, December 2001.